College of Engineering

Emmanuel "Manos" Maragakis, Interim Dean
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Departments of Instruction:

Chemical and Metallurgical Engineering
Civil and Environmental Engineering
Computer Science and Engineering
Electrical and Biomedical Engineering
Mechanical Engineering

Mission Statement

The College of Engineering's mission is closely aligned with the University's land grant mission of teaching, research and outreach. Our purpose is to *expand* the boundaries of knowledge, *advance and create* new information and technology, *develop* the skills, abilities and understanding of our students, *transfer* technology to industry, *positively impact* the Nevada economy and *strive* to provide quality, intellectual courses and programs which will advance engineering and computer science as disciplines and professions. Our graduates will positively impact society at the state, regional and national levels by advancing technology and enhancing economic and cultural development. The College of Engineering's Mission is: ***"Excellence and innovation in engineering and computer education, research and outreach."***

Objectives

The College of Engineering's educational objectives are:

- Our students will be provided with a strong technical and cultural education for their profession or for continued graduate education in an area of specialization.
- Our graduates will have the ability to work individually and in teams to identify and solve complex engineering and computer science problems and will have developed an understanding of interdisciplinary problem solving and system design.
- Our graduates will have a multi-disciplinary technical and practical education which has prepared them for a rapidly changing world based on the commonality of knowledge that engineering and computer science disciplines provide. This will allow our graduates to be able to continuously meet professional objectives throughout their careers.
- A firm foundation will have been provided for professional advancement not just through acquired, advanced engineering and computer knowledge, but also through communication, humanity and social science skills, team and group activities and ethical/professional responsibility as engineers and computer scientists.

Accreditation

The chemical, civil, computer and information engineering, electrical, environmental, materials science and engineering and mechanical engineering programs for the baccalaureate degree are accredited by Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4102 - telelphone: (410) 347-7700. The computer science program for the baccalaureate degree is accredited by the Computer Accreditation Commission (CAC) of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700. Faculty members maintain affiliations with their professional societies and various industrial and governmental organizations that help keep them current in their fields, and provide stimulation for both undergraduate and graduate research projects.

Internships

Several internships are available, in which students may gain funds and experience during the summer (three months), a semester, or for an academic year. For details, refer to the undergraduate curriculum information in each department and inquire at the dean's office.

Degree Programs

Baccalaureate Degrees: Upon satisfactory completion of the prescribed curriculum, engineering students are awarded the degree of bachelor of science in chemical engineering, civil engineering, computer and information engineering, computer science, electrical engineering, engineering physics, environmental engineering, materials science and engineering or mechanical engineering.

Minors: The College of Engineering offers undergraduate minors in civil engineering, computer science, digital interactive games, electrical engineering, engineering physics, environmental engineering, extractive metallurgy, materials science and engineering, mechanical engineering, nanotechnology* and renewable energy*. Specific requirements can be found under the appropriate department or program. It is mandatory for students to satisfy all prerequisites before entering an engineering or computer science course.

In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all engineering minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Graduate Degrees: Subject to the general requirements of the university, the corresponding department and the UNR Graduate School, the following degrees may be earned.

Master of Science: biomedical engineering*, chemical engineering, civil and environmental engineering, computer engineering, computer science, electrical engineering, mechanical engineering, metallurgical engineering, metallurgy and hydrological sciences*.

Doctor of Philosophy: biomedical engineering*, chemical engineering, civil and environmental engineering, computer science and engineering, electrical engineering, mechanical engineering, materials science and engineering and hydrological sciences*.

*Interdisciplinary and Special Program.

Engineering as a Preparatory Degree

Engineering majors currently have one of the highest rates of acceptance to U.S. medical schools. They also have an advantage over other majors in gaining acceptance to architecture, business, dental and law schools. However, engineering students may need to complete additional courses to gain the full benefits of their degree. Students interested in using engineering as a preparatory degree should consult with the associate dean.

Mathematics and Science Entrance Requirements

In addition to the university requirements for admission to the baccalaureate programs (see Admission section of this catalog), the College of Engineering specifically recommends the following entrance requirements for its degree candidates: four units of mathematics (including trigonometry or pre-calculus) and three units of science, including physics and chemistry, and a half year of computer programming. Advanced placement classes in calculus

and science are particularly valuable.

Advisement

All students must receive advisement each semester. All freshmen and incoming transfer students will be advised by the College of Engineering academic advisor. Students **are not** permitted to attend engineering classes without prior advisement from an engineering faculty representative.

Transfer Students

A student from outside the University of Nevada, Reno, who wishes to be accepted into the College of Engineering must follow general university policy for admission.

Baccalaureate Degree Requirements

The university core curriculum requirements are satisfied by engineering core and departmental major requirements. Transfer students may meet core curriculum and departmental requirements with similar course work from other colleges and universities.

In any field of specialization, the degree requirements consist of the university core curriculum requirements and the departmental major requirements. To satisfy degree requirements, students must earn a total of at least 126 to 133 semester credits depending on the degree program.

Engineering students may register for a maximum of nine satisfactory/unsatisfactory (S/U) credits in courses not specifically required in the core curriculum and departmental requirements. This limitation does not apply to AP credits transferred to the university.

In addition to the university requirement of at least a "C" (2.0) average for graduation, College of Engineering students must maintain at least a "C" average in the core mathematics, core science and the major requirements courses. College of Engineering students must also earn at least a "C" in courses designated with an asterisk (*) as shown in each of the degree requirements. For all College of Engineering students, courses requiring a "C" include MATH 181, 182, 283 R, 285, CHEM 121, PHYS 180, 180L, 181, and 181L. The "C" requirement applies to all students including transfers.

Most courses required by College of Engineering students have prerequisites and/or corequisites. Satisfying these requirements is mandatory. Course prerequisites will be enforced in the registration system. In order to register for a course, a student must satisfy the prerequisite requirement(s) or be currently enrolled in the necessary course. When the College of Engineering requires a "C" or better for a course, then this requirement must be met before continuing to a course that has it as a prerequisite.

Candidates for baccalaureate degrees from the College of Engineering may not use technology courses to fulfill the grade requirement for engineering courses. All chemical, civil, computer and information, electrical, environmental, and mechanical engineering students must enroll in ENGR 490 during the semester of their senior year that they also take the national Fundamentals of Engineering examination.

If a grade earned in a required course ***(including technical electives)*** is a "C" (2.0) or above, a repeat grade will not be counted towards the engineering GPA. This does not apply to the university lower division grade replacement policy.

Field Trips: Course requirements in the College of Engineering may include field trips as an integral part of the educational experience. Field trips may be scheduled by the college's student organizations and may also be organized by the college's faculty to meet educational goals and needs.

Application for Graduation

Candidates for graduation should submit a graduation application one semester prior to the anticipated graduation date. The due dates for graduation applications can be found in the university calendar at the front of the general catalog and in the front of each semester's class schedule. Candidates must follow the guidelines for **Graduation Reconciliation** as printed on the DARS report once the candidate has submitted an application for graduation. After the candidate has obtained the appropriate signatures and the DARS **Graduation Reconciliation** has been submitted to the dean's office, it will be reviewed and signed at the dean's office. Only Admissions and Records can certify that a student has officially met all graduation requirements.

Accelerated BS/MS Program

Objective

An Accelerated BS/MS Program encourages our outstanding students in the College of Engineering at the University of Nevada, Reno to obtain a MS degree. A student can do either a Plan A (Thesis) or Plan B (non-thesis) MS degrees.

Program Availability with the College of Engineering

Civil and Environmental Engineering, Computer Science and Engineering, and Electrical and Biomedical Engineering -As shown with both thesis and non-thesis options available for MS portion.

Chemical and Metallurgical Engineering – As shown except only the thesis option will be available.

Admission Requirements

Students apply for the Accelerated Program after completing at least 75 credits towards their BS degree with a 3.2 GPA (only UNR courses are included in the GPA calculation). This will typically occur during the spring of their junior year. Students must have completed their Basic Science courses and at least 30 credits of Engineering Science or Design courses. At least 24 credits of the Engineering Science or

Design classes must have been earned at UNR at time of application. As part of the admission process, a student must select a faculty advisor for their graduate degree.

Program Requirements

Students that are admitted into the program will be allowed to take up to 6-credits of technical electives for their BS degree as 600-level graduate courses. The 600-level courses selected for this purpose must be approved by the student's BS program department and graduate advisor, and permission granted by the Graduate School. 700-level courses can not be taken as long as you are considered an undergraduate student. The student must receive a B or better in the course for it to be considered for the program. The graduate academic advisor must be in the area of specialization that the student has selected for their graduate degree. In order to stay in the program, a student must maintain at least a 3.2 GPA in their UNR degree required courses. Upon completion of all BS requirements, a student will receive their BS degree.

A student must complete the BS degree at UNR to be part of the Accelerated BS/MS Program. During their senior year, student will apply for admission into the Graduate School. The student must meet all the requirements of the Graduate School and the MS degree granting department. This may include a GPA and/or GRE requirement. Only 9 credits of graduate work can be completed before entering into the Graduate School. The GRE would be taken during the 1st semester of the student's senior year. This application must be done before completing the BS degree.

Students will complete all MS degree requirements and may apply the 6 credits of 600-level courses towards both the BS and MS degree requirements. For the MS degree, the student must meet the Graduate School requirement of an average of a 3.0 GPA in courses applied to the MS degree. Courses and/or thesis requirements will be established by the department graduate advisor.

Continuation in the Program

Continuation in the program requires that students maintain a grade point average of 3.2 or higher. If a student's GPA drops below 3.2, the student will be placed on academic probation within the program for one semester. If the student raises their GPA to 3.2 or higher, he or she will be removed from probation and returned in good status to the program. If after one semester the student is not able to raise their GPA sufficiently, they will be removed from the Accelerated Program. At which point they may pursue a BS and MS degrees through normal requirements.

Financial Impact

Student should note that graduate courses do not apply towards the 12 credits required for full time undergraduate standing. In most cases, 12 credits are required for financial aid. Therefore during your senior year, during each semester you should take at least 12 undergraduate courses in addition to your 600-level courses. The 600-level courses will require payment of graduate credit tuition.

CHEMICAL AND METALLURGICAL ENGINEERING

Chemical Engineering

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(775) 784-6771; Fax (775) 327-5059
email: chemeng@unr.edu

Chemical engineers apply the basic principles of chemistry, physics, biology, mathematics and related engineering disciplines to the production of goods and materials for society. Chemical engineers are the technological leaders in fields from the production of computer chips, to the design of pharmaceuticals and artificial organs, to the development of clean and affordable energy systems such as fuel cells. Chemical engineering graduates have the capability for serving the needs of industry and government or for pursuing advanced academic training. Graduates of the chemical engineering program are recruited by the chemical process industries, government, and graduate and professional schools.

In addition to the general university requirement of at least a 2.0 grade-point average, the student must hold at least a 2.0 average in all chemical engineering courses to be eligible for graduation.

All students must see their advisor and obtain a signed Official Advisement Form each semester. All electives must be approved by the assigned chemical engineering faculty advisor. Students who do not meet the prerequisites for MATH 181 should attend summer school prior to their first semester.

All students must take the Fundamentals of Engineering Examination administered by the Nevada Board of Professional Engineers.

There are four emphases within the B.S.Ch.E. program: biomedical, environmental engineering, process engineering, and materials science and engineering.

Student Organizations

Students may participate in many different organizations that will enrich their educational experiences such as the American Institute of Chemical Engineers, American Chemical Society, Society of Women Engineers, and the Engineering Honor Society of Tau Beta Pi.

Program Objectives

The objective of the B.S. Chemical Engineering program at UNR is to prepare students to enter into responsible chemical engineering positions in industry, government, and academe and to excel in the profession.

Many of our students go directly into industry, and some go on to graduate school. We intend to prepare them for either career track, and we intend to develop in our students not just the technical foundations of the field but also a commitment to professional development through life-long learning and critical thinking. In support of this objective, we have developed three detailed program objectives.

- Our graduates will be successful in their professional careers, as demonstrated by their abilities to solve important chemical engineering problems, to solve problems in areas different from their training, and to develop new and valuable ideas.
- Our graduates will be aware of the larger context of the application of engineering, including global, ethical, environmental, societal, and legal concerns.
- Our graduates will have the communication and problem-solving skills necessary to succeed individually, in group, and in leadership positions.

Bachelor of Science in Chemical Engineering

BIOMEDICAL EMPHASIS

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 36

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3 credits

ENG 102—Composition II 3

NOTE: Students who place in ENG 102 are not required to complete ENG 101. Placing in ENG 102 is a requirement for admission to this emphasis.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I 4
CHEM 202—General Chemistry for Scientists and Engineers II 4

D. Social Sciences—3 credits-Select one:

ECON 102— Principles of Microeconomics **OR**
ECON 103 —Principles of Macroeconomics 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. Must not be a skills course 3

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses—6 credits

CHE 450—Techniques of Process Design, Economics and Safety 3
CHE 482—Design Project 3

H. Diversity

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. This requirement can be satisfied simultaneously with the Fine Arts requirement. 0

II. ADDITIONAL SCHOOL REQUIREMENTS 0

III. MAJOR REQUIREMENTS 97

BIOL 190—Intro to Cell and Molecular Biology 3
BIOL 191—Introduction to Organismal Biology 3
BIOL 251—General Microbiology 4
CHE 101 R—Introduction to Chemical Engineering I 3
CHE 102—Introduction of Chemical Engineering II 3
CHE 232—Principles of Chemical Engineering* 3
CHE 245—Computer Applications in Chemical Engineering 3
CHE 361—Chemical Engineering Thermodynamics 4
CHE 373—Transport Phenomena I 3
CHE 374—Transport Phenomena II 3
CHE 440—Chemical Reactor Design 3
CHE 441—Unit Operations Laboratory I 1
CHE 442—Unit Operations Laboratory II 2
CHE 450—See Core Curriculum capstone requirement
CHE 451—Control of Process Systems 4
CHE 475—Principles of Bioengineering 3
CHE 482—See Core Curriculum capstone requirement
CHE 485 R—Separation Processes 3
CHEM 341—Organic Chemistry for Scientists and Professionals I 3
CHEM 342—Organic Chemistry for Scientists and Professionals II 3
CHEM 345—Organic Chemistry Lab 2
CHEM 421—Physical Chemistry I 3
CHEM 422—Physical Chemistry II 3
CHEM 423—Physical Chemistry Laboratory 3

CEE/ME 241—Statics....3
ENGR 301—Engineering Communications....3
ENGR 490—FE Exam....0
EE 220—Circuits I....3
MATH 182—Calculus II*....4
MATH 283 R—Calculus III*....4
MATH 285—Differential Equations*....3
MATH/STAT 352—Probability and Statistics....3
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 180L—Physics for Scientists & Engineers Lab I*....1
PHYS 181L—Physics for Scientists & Engineers Lab II*....1
Engineering Elective+....1

IV. MINOR REQUIREMENTS....0

V. ELECTIVES....0

VI. TOTAL CREDITS....133

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—First Semester

CHE 101 R—Introduction to Chemical Engineering I....3
CHEM 201—General Chemistry for Scientists and Engineers I....4
ECON 102—Principles of Microeconomics **OR**
ECON 103— Principles of Macroeconomics....3
ENG 102—Composition II....3
MATH 181—Calculus I*....4
TOTAL....17

First Year—Second Semester

BIOL 190—Intro to Cell and Molecular Biology....3
CHEM 202—General Chemistry for Scientists and Engineers II....4
CHE 102—Introduction to Chemical Engineering II....3
MATH 182—Calculus II*....4
PHYS 180—Physics for Scientists and Engineering I*....3
PHYS 180L—Physics for Scientists and Engineers Laboratory I*....1
TOTAL....18

Second Year—First Semester

BIOL 191—Introduction to Organismal Biology....3
CHE 232—Principles of Chemical Engineering*....3
CHEM 341—Organic Chemistry for Scientists and Professionals I....3
MATH 283 R—Calculus III*....4
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 181L—Physics for Scientists and Engineers Laboratory II*....1
TOTAL....17

Second Year—Second Semester

CHE 245—Computer Applications in Chemical Engineering....3
CHEM 342—Organic Chemistry for Scientists and Professionals II....3
CEE/ME 241—Statics....3
CH 201—Ancient and Medieval Cultures....3
CHEM 345—Organic Chemistry Laboratory....2
MATH 285—Differential Equations*....3
TOTAL....17

Third Year—First Semester

BIOL 251—General Microbiology....4
CHE 373—Transport Phenomena I....3
CHEM 421—Physical Chemistry I....3
ENGR 301—Engineering Communications....3
MATH/STAT 352—Probability and Statistics....3
TOTAL....16

Third Year—Second Semester

CHE 374—Transport Phenomena II....3
CHE 361—Chemical Engineering Thermodynamics....4
CHE 475—Principles of Bioengineering....3
CHEM 422—Physical Chemistry II....3
CHEM 423—Physical Chemistry Laboratory....3
TOTAL....16

Fourth Year-First Semester

Engineering Elective+....1
CHE 440—Chemical Reactor Design....3
CHE 441—Unit Operations Lab I....1
CHE 450—Techniques of Process Design, Economics Safety....3
CHE 485 R—Separation Process....3
CH 202—The Modern World....3
TOTAL....14

Fourth Year-Second Semester

CHE 442—Unit Operations Lab II....2
CHE 451—Process Control....4
CHE 482—Design Project....3
Core Curriculum, diversity and fine arts requirement....3
CH 203—American Experience....3
EE 220—Circuits I....3
ENGR 490—FE Exam....0
TOTAL....18

+Choice of electives must satisfy the biomedical emphasis. (Emphasis electives are available from the department and on the web site.) All electives require prior approval by departmental advisor.

Bachelor of Science in Chemical Engineering
ENVIRONMENTAL ENGINEERING EMPHASIS

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS....36-41

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog....3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I*....4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I....4
CHEM 202—General Chemistry for Scientists and Engineers II....4

D. Social Sciences—3 credits—Select one:

ECON 102—Principles of Microeconomics **OR**
ECON 103—Principles of Macroeconomics....3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. Must not be a skills course....3

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures....3
CH 202—The Modern World....3
CH 203—American Experiences and Constitutional

Change....3

G. Capstone Courses—6 credits

CHE 450—Techniques of Process Design, Economics and Safety....3
CHE 482—Design Project....3

H. Diversity

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. This requirement can be satisfied simultaneously with the Fine Arts requirement....0

II. ADDITIONAL SCHOOL REQUIREMENTS....0

III. MAJOR REQUIREMENTS....94

BIOL 190—Introduction to Cell and Molecular Biology....3
CEE/ME 241—Statics....3
CEE 411—Environmental Law....3
CHE 101 R—Introduction to Chemical Engineering I....3
CHE 102—Introduction to Chemical Engineering II....3
CHE 232—Principles of Chemical Engineering*....3
CHE 245—Computer Applications in Chemical Engineering....3
CHE 361—Chemical Engineering Thermodynamics....4
CHE 373—Transport Phenomena I....3
CHE 374—Transport Phenomena II....3
CHE 410—Renewable Energy Systems....3
CHE 440—Chemical Reactor Design....3
CHE 441—Unit Operations Laboratory I....1
CHE 442—Unit Operations Laboratory II....2
CHE 450—See Core Curriculum capstone requirement
CHE 451—Control of Process Systems....4
CHE 482—See Core Curriculum capstone requirement
CHE 485 R—Separation Processes....3
CHEM 341—Organic Chemistry for Scientists and Professionals I....3
CHEM 421—Physical Chemistry I....3
CHEM 422—Physical Chemistry II....3
CHEM 423—Physical Chemistry Laboratory....3
ENGR 301—Engineering Communications....3
ENGR 490—FE Exam....0
GE 484—Groundwater Hydrology....3
MATH 182—Calculus II*....4
MATH 283 R—Calculus III*....4
MATH 285—Differential Equations*....3
MATH/STAT 352—Probability and Statistics....3
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 180L—Physics for Scientists & Engineers Lab I*....1
PHYS 181L—Physics for Scientists & Engineers Lab II*....1
Technical Electives+....7

IV. MINOR REQUIREMENTS....0

V. ELECTIVES....0-3

VI. TOTAL CREDITS....133

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—First Semester

CHEM 201—General Chemistry for Scientists and Engineers I....4
CHE 101 R—Introduction to Chemical Engineering I....3
ECON 102—Principles of Microeconomics **OR**
ECON 103—Principles of Macroeconomics....3
ENG 101—Composition I....3
MATH 181—Calculus I*....4
TOTAL....17

First Year — Second Semester

CHE 102— Introduction to Chemical Engineering II....3
CHEM 202—General Chemistry for Scientists and Engineers II....4
ENG 102—Composition II....3
MATH 182—Calculus II*....4
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 180L—Physics for Scientists and Engineers Lab I*.1
TOTAL....18

Second Year—First Semester

CHE 232—Principles of Chemical Engineering*....3
CHEM 341—Organic Chemistry for Scientists and Professionals I....3
CH 201—Ancient and Medieval Cultures....3
MATH 283 R—Calculus III*....4
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 181L—Physics for Scientists and Engineers Lab II*1
TOTAL....17

Second Year—Second Semester

CHE 245—Computer Applications in Chemical Engineering....3
CEE/ME 241—Statics....3
CH 202—The Modern World....3
ENGR 301—Engineering Communications....3
MATH 285—Differential Equations*....3
TOTAL....15

Third Year—First Semester

Core Curriculum Diversity and Fine Arts course....3
CHE 301—Introduction to Sustainable Energy Resources 3
CHE 373—Transport Phenomena I....3
CHEM 421—Physical Chemistry I....3
CH 203—American Experiences and Constitutional Change....3
MATH/STAT 352—Probability and Statistics....3
TOTAL....18

Third Year—Second Semester

CHE 361—Chemical Engineering Thermodynamics....4
CHE 374—Transport Phenomena II....3
CHEM 422—Physical Chemistry II....3
CHEM 423—Physical Chemistry Lab....3
Environmental science elective+....3
TOTAL....16

Fourth Year—First Semester

CHE 440—Chemical Reactor Design....3
CHE 441—Unit Operations Lab I....1
CHE 450—Techniques of Process Design, Economics and Safety....3
CHE 485 R—Separation Processes....3
GE 484—Groundwater Hydrology....3
Environmental engineering elective+....4
TOTAL....17

Fourth Year—Second Semester

CEE 411—Environmental Law....3
CHE 410—Renewable Energy Systems....3
CHE 442—Unit Operations Lab II....2

CHE 451—Process Control 4
CHE 482—Design Project 3
ENGR 490—FE Exam....0
TOTAL 15

+Choice of electives must satisfy environmental engineering emphasis. (Emphasis electives are available from the department and on the web site.) All electives require prior approval by departmental advisor.

Bachelor of Science in Chemical Engineering
MATERIAL SCIENCE & ENGINEERING EMPHASIS

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 36-41

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog....3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I*....4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I 4
CHEM 202—General Chemistry for Scientists and Engineers II....4

D. Social Sciences—3 credits—Select one:

ECON 102—Principles of Microeconomics **OR**
ECON 103—Principles of Macroeconomics 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. Must **not** be a skills course....3

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change....3

G. Capstone Courses—6 credits

CHE 450—Techniques of Process Design, Economics and Safety 3
CHE 482—Design Project 3

H. Diversity

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. This requirement can be satisfied simultaneously with the Fine Arts requirement....0

II. ADDITIONAL SCHOOL REQUIREMENTS 0

III. MAJOR REQUIREMENTS....94

CHE 101 R—Introduction to Chemical Engineering I 3
CHE 102—Introduction to Chemical Engineering II....3
CHE 232—Principles of Chemical Engineering* 3
CHE 245—Computer Applications in Chemical Engineering....3
CHE 361—Chemical Engineering Thermodynamics 4
CHE 373—Transport Phenomena I 3
CHE 374—Transport Phenomena II 3
CHE 406—Introduction to Polymer Science Engineering....3
CHE 440—Chemical Reactor Design 3
CHE 441—Unit Operations Laboratory I 1
CHE 442—Unit Operations Laboratory II 2
CHE 450—See Core Curriculum capstone requirement
CHE 451—Dynamic Process Modeling and Control 4
CHE 482—See Core Curriculum capstone requirement
CHE 485 R—Separation Processes 3
CHEM 341—Organic Chemistry for Scientists and Professionals I....3
CHEM 421—Physical Chemistry I....3
CHEM 422—Physical Chemistry II....3
CHEM 423—Physical Chemistry Laboratory 3
CEE/ME 241—Statics 3
ENGR 301—Engineering Communications....3
ENGR 490—FE Exam....0
MATH 182—Calculus II *....4
MATH 283 R—Calculus III *....4
MATH 285—Differential Equations* 3
MATH/STAT 352—Probability and Statistics....3
MSE 250—Elements of Material Science....3
PHYS 180—Physics for Scientists and Engineers I* 3
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 182—Introduction to Physics III **OR**
CHEM 449—Polymer Chemistry....3
PHYS 180L—Physics for Scientists and Engineers Laboratory I *....1
PHYS 181L—Physics for Scientists and Engineers Laboratory II*....1
Technical Electives + ... 10

IV. MINOR REQUIREMENTS....0

V. ELECTIVES 0-3

VI. TOTAL CREDITS....133

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—First Semester

CHE 101 R—Introduction to Chemical Engineering I 3
CHEM 201—General Chemistry for Scientists and Engineers I 4
ECON 102—Principles of Microeconomics **OR**
ECON 103—Principles of Macroeconomics....3
ENG 101—Composition I 3
MATH 181—Calculus I *....4
TOTAL 17

First Year — Second Semester

CHE 102—Introduction to Chemical Engineering II....3
CHEM 202—General Chemistry for Scientists and Engineers II....4
ENG 102—Composition II 3
MATH 182—Calculus II *....4
PHYS 180—Physics for Scientists and Engineers I 3
PHYS 180L—Physics for Scientists and Engineers Lab I ...1
TOTAL 18

Second Year—First Semester

CHE 232—Principles of Chemical Engineering *....3
CHEM 341—Organic Chemistry for Scientists and Professionals I 3
CH 201—Ancient and Medieval Cultures 3
MATH 283 R—Calculus III *....4
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 181L—Physics for Scientists and Engineers Laboratory II *....1

TOTAL 17

Second Year—Second Semester

CHE 245—Computer Applications in Chemical Engineering 3
CEE/ME 241—Statics 3
CH 202—The Modern World 3
ENGR 301—Engineering Communications 3
MATH 285—Differential Equations* 3
TOTAL 15

Third Year—First Semester

CHE 373—Transport Phenomena I 3
CHEM 421—Physical Chemistry I 3
CH 203—American Experiences and Constitutional Change 3
MATH/STAT 352—Probability and Statistics 3
MSE 250—Elements of Material Science 3
Core Curriculum, diversity and fine arts requirement 3
TOTAL 18

Third Year—Second Semester

CHE 361—Chemical Engineering Thermodynamics 4
CHE 374—Transport Phenomena II 3
CHEM 422—Physical Chemistry II 3
CHEM 423—Physical Chemistry Lab 3
Technical Electives+ 3
TOTAL 16

Fourth Year—First Semester

CHE 440—Chemical Reactor Design 3
CHE 441—Unit Operations Lab I 1
CHE 450—Techniques of Process Design, Economics and Safety 3
CHE 485 R—Separation Processes 3
CHEM 449—Polymer Chemistry **OR**
PHYS 182—Physics for Scientists and Engineers III 3
Technical Elective+ 3
TOTAL 16

Fourth Year—Second Semester

CHE 406—Introduction to Polymer Science and Engineering 3
CHE 442—Unit Operations Lab II 2
CHE 451—Process Control 4
CHE 482—Design Project 3
Technical elective+ 4
ENGR 490—FE Exam 0
TOTAL 16

+Choice of electives must satisfy material science and engineering emphasis. (Emphasis electives are available from the department and on the web site.) All electives require prior approval by departmental advisor.

Bachelor of Science in Chemical Engineering

PROCESS AND ENERGY ENGINEERING EMPHASIS

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 36-41

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I 4
CHEM 202—General Chemistry for Scientists and Engineers II 4

D. Social Sciences—3 credits—Select one:

ECON 102—Principles of Microeconomics **OR**
ECON 103—Principles of Macroeconomics 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. Must not be a skills course 3

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses—6 credits

CHE 450—Techniques of Process Design, Economics and Safety 3
CHE 482—Design Project 3

H. Diversity

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. This requirement can be satisfied simultaneously with the Fine Arts requirement.

II. ADDITIONAL SCHOOL REQUIREMENTS 0

III. MAJOR REQUIREMENTS 94

CEE 372—Strength of Materials 3
CHE 101 R—Introduction to Chemical Engineering I 3
CHE 102—Introduction to Chemical Engineering II 3
CHE 232—Principles of Chemical Engineering* 3
CHE 245—Computer Applications in Chemical Engineering 3
CHE 361—Chemical Engineering Thermodynamics 4
CHE 373—Transport Phenomena I 3
CHE 374—Transport Phenomena II 3
CHE 410—Renewable Energy Systems 3
CHE 415—Introduction to Particle Technology 3
CHE 440—Chemical Reactor Design 3
CHE 441—Unit Operations Laboratory I 1
CHE 442—Unit Operations Laboratory II 2
CHE 450—See Core Curriculum capstone requirement
CHE 451—Dynamic Process Molding 4
CHE 482—See Core Curriculum capstone requirement
CHE 485 R—Separation Processes 3
CHEM 330—Analytical Chemistry 4
CHEM 341—Organic Chemistry for Scientists and Professionals I 3
CHEM 421—Physical Chemistry I 3
CHEM 422—Physical Chemistry II 3
CHEM 423—Physical Chemistry Laboratory 3
EE 220—Circuits I 3
ENGR 301—Engineering Communications 3
ENGR 490—FE Exam 0
MATH 182—Calculus II* 4
MATH 283 R—Calculus III* 4
MATH 285—Differential Equations* 3
MATH/STAT 352—Probability and Statistics 3
CEE/ME 241—Statics 3
PHYS 180—Physics for Scientists and Engineers I* 3
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 180L—Physics for Scientists & Engineers

Lab I *....1
PHYS 181L—Physics for Scientists and Engineers Lab II *....1
Technical Electives +....3

IV. MINOR REQUIREMENTS....0

V. ELECTIVES....0-3

VI. TOTAL CREDITS....133

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—First Semester

CHE 101 R—Introduction to Chemical Engineering I....3
CHEM 201—General Chemistry for Scientists and Engineers I....4
ECON 102—Principles of Microeconomics **OR**
ECON 103—Principles of Macroeconomics....3
ENG 101—Composition I....3
MATH 181—Calculus I*....4
TOTAL....17

First Year—Second Semester

CHE 102—Introduction to Chemical Engineering II....3
CHEM 202—General Chemistry for Scientists and Engineers II....4
ENG 102—Composition II....3
MATH 182—Calculus II *....4
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 180L—Physics for Scientists & Engineers Lab I *....1
TOTAL....18

Second Year—First Semester

CHE 232—Principles of Chemical Engineering*....3
CHEM 341—Organic Chemistry for Scientists and Professionals I....3
CH 201—Ancient and Medieval Cultures....3
MATH 283 R—Calculus III*....4
PHYS 181—Physics for Scientists and Engineers II *....3
PHYS 181L—Physics for Scientists and Engineers Laboratory II*....1
TOTAL....17

Second Year—Second Semester

CHE 245—Computer Applications in Chemical Engineering....3
CEE/ME 241—Statics....3
CH 202—The Modern World....3
ENGR 301—Engineering Communications....3
MATH 285—Differential Equations *....3
TOTAL....15

Third Year—First Semester

CEE 372—Strength of Materials....3
CHE 301—Introduction to Sustainable Energy Resources 3
CHE 373—Transport Phenomena I....3
CHEM 421—Physical Chemistry I....3
CH 203—American Experiences and Constitutional Change....3
MATH/STAT 352—Probability and Statistics....3
TOTAL....18

Third Year—Second Semester

CHE 361—Chemical Engineering Thermodynamics....4
CHE 374—Transport Phenomena II....3
CHEM 422—Physical Chemistry II....3
CHEM 423—Physical Chemistry Lab....3
EE 220—Circuits I....3
EE 220L—Circuits Lab I....1
TOTAL....17

Fourth Year—First Semester

CHE 415—Introduction to Particle Technology....3
CHE 440—Chemical Reactor Design....3
CHE 441—Unit Operations Lab I....1
CHE 450—Techniques of Process Design, Economics and Safety....3
Technical Elective....3
CHE 485 R—Separation Processes....3
TOTAL....16

Fourth Year—Second Semester

CHE 410—Renewable Energy Systems....3
CHE 442—Unit Operations Lab II....2
CHE 451—Process Control....4
CHE 482—Design Project....3
Core Curriculum, diversity and fine arts requirement....3
ENGR 490—FE Exam....0
TOTAL....15

+Choice of electives must satisfy process engineering emphasis. (Emphasis electives are available from the department and on the web site.) All electives require prior approval by departmental advisor.

Advanced Degrees

Master of science and doctor of philosophy degrees are offered in chemical engineering. Students must have an engineering undergraduate degree, except those with a B.S. in chemistry, who may be admitted to the special M.S. program by taking additional preparatory courses. All applicants must provide scores on the general part of the GRE examination. Deadlines for assistantships are March 15 for fall and October 1 for spring.

Requirements include the following core:

CHE 741—Advanced Kinetics and Reactor Design
CHE 760—Advanced Chemical Engineering Thermodynamics
CHE 764—Advanced Transport Phenomena I
CHE 765—Advanced Transport Phenomena II
CHE 790—Chemical Engineering Research Seminar (2 credits for M.S., 6 credits for Ph.D.)
CHE 795 R—Comprehensive Examination (Ph.D. only, written original research proposal plus oral defense)
CHE 797—Thesis (M.S. only-6 credits)
CHE 799—Dissertation (Ph.D. only-24 credits)
Electives (M.S.)—10 graduate course credits approved by thesis committee
Electives (Ph.D.)—30 graduate course credits approved by dissertation committee (including at least 12 graduate course credits at the 700-level)
Oral Qualifying Examination (Ph.D.)

For additional requirements, please see the Graduate School section of this catalog and http://www.unr.edu/chemengr/newgrad.htm.

Research and teaching assistantships are available to Ph.D. students. Current areas of research specialization are: biomaterials, chemical process safety, polymer engineering, process control, biomedical engineering, fuel cells, renewable energy, process simulation, molecular simulation, surface and colloid engineering, applied surfactant research, fluidization, process design and optimization, separation processes, water treatment, phase equilibria, reaction engineering, and risk analysis.

Materials Science and Engineering

474 Laxalt Mineral Research Building
(775) 784-6771; Fax (775) 327-5059
email: meteng@unr.edu

Materials Science and Engineering includes elements from a variety of engineering disciplines, and the demand for professionals in the field is strong. Engineers trained in materials science are at the forefront in the development of materials designed to contain ultra-

high temperatures and pressures in aircraft, spacecraft and energy generation systems. In the materials field, engineers also develop electronic, photovoltaic and superconductor devices, as well as other high-technology innovations. The materials science and engineering program requires that students gain basic preparation in chemistry, physics and mathematics during their first two years of university-level study. Early in the sophomore year, students are taught the principles of the atomic and microscopic structure and properties of metallic, ceramic, polymeric (plastic), composite, and electronic materials. Advanced instruction, featuring specialized courses in structure, mechanical, and physical properties, corrosion, phase transformations, and nanotechnology. Graduates can pursue a diverse selection of careers, including materials processing and manufacturing, materials selection for advanced applications and design and development of new materials. Outstanding graduates may also pursue advanced graduate study.

Program Objectives

- Enable students to apply advanced science and engineering principles to materials systems (ceramics, glasses, composites, metals, polymers) in the context of material structure, behavior, processing, and performance.
- Develop skills in our students to solve real world materials engineering problems with creativity and professionalism, and to develop new, valuable ideas through critical thinking.
- Provide students with the skills to communicate well with others through verbal, oral and written presentations, and listening, and will develop team skills in solving problems.
- Teach students the importance of ethical engineering practice with an emphasis on developing an understanding of the legal, moral, and environmental responsibilities and consequences of engineering problem solving.
- Prepare students to enter a broad range of Materials Engineering careers by providing diversity within the program and opportunity for exploration of different areas (e.g., biotechnology, nanotechnology, ceramics, polymers, metals, and more.)

In keeping with the above objectives, graduates will understand and be able to apply advanced science and engineering principles to materials systems, i.e., ceramics, glasses, composites, metals and polymers. Graduates will be able to apply these in the context of material structure, behavior, processing, and performance.

In addition to the university's general graduation requirements of a minimum 2.0 grade point average, degree candidates must maintain at least a 2.0 average in Material Science and Engineering courses. All students must see their assigned advisor and obtain a signed official advisement form each semester. All electives must be approved by the assigned advisor. All students must take the Fundamentals of Engineering Examination, administered by the Nevada State Board of Professional Engineers.

Student Organizations

Students are encouraged to participate in many different organizations within the College of Engineering that will enrich their educational experiences. These include: the Materials Advantage and Research Society (MARS), which is associated with the Minerals, Metals and Materials Society (TMS), the American Society for Metals (ASM), the Materials Research Society (MRS), and the American Ceramic Society (ACerS); the Society of Hispanic Professional Engineers (SHPE), the Society of Woman Engineers, and the Society for Mining, Metallurgy and Exploration (SME).

Bachelor of Science in Materials Science and Engineering

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 42-44

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Science—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I* 4

CHEM 202—General Chemistry for Scientists and Engineers II* 4

D. Social Sciences—3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog 3

NOTE: It is recommended (but not required) that MSE students select from ECON 102, ECON 103, RECO 202, or HON 220.)

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. Must not be a skills course 3

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3

CH 202—The Modern World 3

CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses—6 credits

MSE 450—Techniques of Process Design, Economics and Safety 3

MSE 482—Design Project 3

H. Diversity—3 credits

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog 3

II. ADDITIONAL SCHOOL REQUIREMENTS 0

III. MAJOR REQUIREMENTS 84

CEE/ME 241—Statics 3

CEE 372—Strength of Materials 3

CHE 245—Computer Applications in Chemical Engineering 3

EE 220—Circuits I 3

ENGR 301—Engineering Communications 3

ENGR 490—Fundamentals of Engineering Exam 0

MATH 182—Calculus II* 4

MATH 283 R—Calculus III* 4

MATH 285—Differential Equations* 3

MATH/STAT 352—Probability and Statistics 3

MSE 101—Introduction to Metallurgical Engineering I 2

MSE 102—Introduction to Metallurgical Engineering II 2

MSE 232—Principles of Metallurgical Engineering* 3

MSE 250—Elements of Material Science* 3

MSE 361—Thermodynamics of Materials 3

MSE 383—Transport in Materials Systems 3

MSE 415—Materials Characterization 3

MSE 416—X-Ray Diffraction 3

MSE 430—Phase Transformations and Kinetics 3

MSE 433—Electronic, Magnetic and Optical Properties of Materials 3

MSE 450—See Core Curriculum Capstone Requirement

MSE 460—Physical Metallurgy I 4

MSE 461—Physical Metallurgy II 3

MSE 470—Polymeric and Composite Materials 3

MSE 472—Introduction to Ceramics 3

MSE 482—See Core Curriculum Capstone Requirement.
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 180L—Physics for Scientists and Engineers Lab I*....1
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 181L—Physics for Scientists and Engineers Lab II*....1
Technical Electives+....6

IV. MINOR REQUIREMENTS....0

V. ELECTIVES....0**

**** If a student places out of any courses, the student must take additional open elective credits, such that 126 credits are completed for the major. The open electives must be approved by the departmental advisor. This requirement does not apply to AP credits earned or approved transfer credits.**

VI. TOTAL CREDITS....126

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—Fall Semester
CHEM 201—General Chemistry for Scientists and Engineers I*....4
ENG 101—Composition I....3
MSE 101—Introduction to Metallurgical Engineering I....2
MATH 181—Calculus I*....4
Social Sciences (Core)....3
TOTAL....16

First Year—Spring Semester
CHEM 202—General Chemistry for Scientists and Engineers II*....4
ENG 102—Composition II....3
MATH 182—Calculus II*....4
MSE 102—Introduction to Metallurgical Engineering II....2
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 180L—Physics for Scientists and Engineers Lab I*....1
TOTAL....17

Second Year—Fall Semester
CEE/ME 241—Statics....3
MSE 232—Principles of Metallurgical Engineering*....3
MSE 250—Elements of Material Science*....3
MATH 283 R—Calculus III*....4
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 181L—Physics for Scientists and Engineers Lab II*....1
TOTAL....17

Second Year—Spring Semester
CH 201—Ancient and Medieval Cultures....3
CHE 245—Computer Applications in Chemical Engineering....3
EE 220—Circuits I....3
ENGR 301—Engineering Communications....3
MATH 285—Differential Equations*....3
TOTAL....15

NOTE: If a student starts the Third Year - Fall Semester in an Odd Year follow below:

Third Year—Fall Semester
CEE 372—Strength of Materials....3
CH 202—The Modern World....3
MSE 383—Transport in Materials Systems....3
MSE 361—Thermodynamics of Materials....3
MSE 460—Physical Metallurgy I....4
TOTAL....16

Third Year—Spring Semester
CH 203—American Experiences and Constitutional Change....3
MSE 415—Materials Characterization....3
MSE 430—Phase Transformations and Kinetics....3
MSE 461—Physical Metallurgy II....3
MSE 472—Introduction to Ceramics....3
TOTAL....15

Fourth Year—Fall Semester
MATH/STAT 352—Probability and Statistics....3
MSE 450—Techniques of Process Design, Economics and Safety....3
Diversity (Core)....3
Fine Arts (Core)....3
Elective+....3
TOTAL....15

Fourth Year—Spring Semester
ENGR 490—Fundamentals of Engineering Exam....0
MSE 416—X-ray Diffraction....3
MSE 433—Electronic, Magnetic and Optical Properties of Materials....3
MSE 470—Polymeric and Composite Materials....3
MSE 482—Design Project....3
Elective+....3
TOTAL....15

NOTE: If a student starts the Third Year - Fall Semester in an Even Year follow below:

Third Year—Fall Semester
CEE 372—Strength of Materials....3
CH 202—The Modern World....3
MSE 383—Transport in Materials Systems....3
MSE 361—Thermodynamics of Materials....3
MSE 460—Physical Metallurgy I....4
TOTAL....16

Third Year—Spring Semester
CH 203—American Experiences and Constitutional Change....3
MSE 416—X-ray Diffraction....3
MSE 433—Electronic, Magnetic, and Optical Properties of Materials....3
MSE 461—Physical Metallurgy II....3
MSE 470—Polymeric and Composite Materials....3
TOTAL....15

Fourth Year—Fall Semester
MATH/STAT 352—Probability and Statistics....3
MSE 450—Techniques of Process Design, Economics and Safety....3
Diversity (Core)....3
Fine Arts (Core)....3
Elective+....3
TOTAL....15

Fourth Year—Spring Semester
ENGR 490—Fundamentals of Engineering Exam....0
MSE 415—Materials Characterization....3
MSE 430—Phase Transformations and Kinetics....3
MSE 472—Introduction to Ceramics....3
MSE 482—Design Project....3
Elective+....3
TOTAL....15

+All electives require prior approval by departmental advisor.

*In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science

courses and the major requirements courses.

Bachelor of Science in Materials Science and Engineering
NUCLEAR MATERIALS EMPHASIS

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 42-44

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Science—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I* 4

CHEM 202—General Chemistry for Scientists and Engineers II* 4

D. Social Sciences—3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog 3

NOTE: It is recommended (but not required) that MSE students select from ECON 102, ECON 103, RECO 202, or HON 220.)

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. Must not be a skills course.

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3

CH 202—The Modern World 3

CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses—6 credits

MSE 450—Techniques of Process Design, Economics and Safety 3

MSE 482—Design Project 3

H. Diversity—3 credits

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog

II. ADDITIONAL SCHOOL REQUIREMENTS 0

III. MAJOR REQUIREMENTS 84

CEE/ME 241—Statics 3

CEE 372—Strength of Materials 3

CHE 245—Computer Applications in Chemical Engineering 3

EE 220—Circuits I 3

ENGR 301—Engineering Communications 3

ENGR 490—Fundamentals of Engineering Exam 0

MATH 182—Calculus II* 4

MATH 283 R—Calculus III* 4

MATH 285—Differential Equations* 3

MATH/STAT 352—Probability and Statistics 3

MSE 101—Introduction to Metallurgical Engineering I 2

MSE 102—Introduction to Metallurgical Engineering II 2

MSE 232—Principles of Metallurgical Engineering* 3

MSE 250—Elements of Material Science* 3

MSE 361—Thermodynamics of Materials 3

MSE 383—Transport in Materials Systems 3

MSE 403—Materials Applications in Nuclear Reactors 3

MSE 4xx—To Be Determined 3

MSE 415—Materials Characterization 3

MSE 416—X-Ray Diffraction 3

MSE 430—Phase Transformations and Kinetics 3

MSE 433—Electronic, Magnetic and Optical Properties of Materials 3

MSE 435—Corrosion Degradation of Nuclear Materials 3

MSE 450—See Core Curriculum Capstone Requirement

MSE 460—Physical Metallurgy I 4

MSE 470—Polymeric and Composite Materials 3

MSE 472—Introduction to Ceramics 3

MSE 482—See Core Curriculum Capstone Requirement

PHYS 180—Physics for Scientists and Engineers I* 3

PHYS 180L—Physics for Scientists and Engineers Lab I* 1

PHYS 181—Physics for Scientists and Engineers II* 3

PHYS 181L—Physics for Scientists and Engineers Lab II* 1

IV. MINOR REQUIREMENTS 0

V. ELECTIVES 0**

** If a student places out of any courses, the student must take additional open elective credits, such that 126 credits are completed for the major. This requirement does not apply to AP credits earned or approved transfer credits.

VI. TOTAL CREDITS 126

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—Fall Semester

CHEM 201—General Chemistry for Scientists and Engineers I* 4

ENG 101—Composition I 3

MSE 101—Introduction to Metallurgical Engineering I 2

MATH 181—Calculus I * 4

Core Social Sciences 3

TOTAL 16

First Year—Spring Semester

CHEM 202—General Chemistry for Scientists and Engineers II* 4

ENG 102—Composition II 3

MATH 182—Calculus II* 4

MSE 102—Introduction to Metallurgical Engineering II 2

PHYS 180—Physics for Scientists and Engineers I* 3

PHYS 180L—Physics for Scientists and Engineers Lab I 1

TOTAL 17

Second Year—Fall Semester

CEE/ME 241—Statistics 3

MSE 232—Principles of Metallurgical Engineering* 3

MSE 250—Elements of Materials Science and Engineering II* 3

MATH 283 R—Calculus III* 4

PHYS 181—Physics for Scientists and Engineers II* 3

PHYS 181L—Physics for Scientists and Engineers Lab II* 1

TOTAL 17

Second Year—Spring Semester

CH 201—Ancient and Medieval Cultures 3

CHE 245—Computer Applications in Chemical Engineering 3

EE 220—Circuits I....3
ENGR 301—Engineering Communications....3
MATH 285—Differential Equations*....3
TOTAL....15

NOTE: If student starts the Third Year—Fall Semester in an odd numbered year, follow below:

Third Year—Fall Semester (Odd-Numbered Year)

CEE 372—Strength of Materials....3
CH 202—The Modern World....3
MSE 383 Transport in Materials Systems....3
MSE 361—Thermodynamics of Materials....3
MSE 460 Physical Metallurgy I....4
TOTAL....16

Third Year—Spring Semester

CH 203—American Experiences and Constitutional Change....3
MSE 415—Materials Characterization....3
MSE 430—Phase Transformation and Kinetics....3
MSE 403—Materials Applications in Nuclear Reactors....3
MSE 472—Introduction to Ceramics....3
TOTAL....15

Fourth Year—Fall Semester

MSE 4xx—Fundamentals of Nuclear Energy....3
MSE 450—Techniques of Process Design, Economics Safety....3
MATH/STAT 352—Probability & Statistics....3
Diversity course....3
Core Fine Arts course....3
TOTAL....15

Fourth Year—Spring Semester

ENGR 490—FE Exam....0
MSE 416—X-Ray Diffraction....3
MSE 433—Electronic, Magnetic, and Optical Properties of Materials....3
MSE 435—Corrosion Degradation of Nuclear Materials....3
MSE 470—Polymeric and Composite Materials....3
MSE 482—Design Project....3
TOTAL....15

NOTE: If student starts the Third Year—Fall semester in an even numbered year, follow below:

Third Year—Fall Semester (Even-Numbered Year)

CEE 372—Strength of Materials....3
CH 202—The Modern World....3
MSE 383—Transport in Materials Systems....3
MSE 361—Thermodynamics of Materials....3
MSE 460—Physical Metallurgy I....4
TOTAL....16

Third Year—Spring Semester

CH 203—American Experiences and Constitutional Change....3
MSE 416—X-Ray Diffraction....3
MSE 433—Electronic, Magnetic, and Optical Properties of Materials....3
MSE 403—Materials Applications in Nuclear Reactors....3
MSE 470—Polymeric and Composite Materials....3
TOTAL....15

Fourth Year—Fall Semester

MSE 450—Techniques of Process Design, Economics and Safety....3
MSE 4xx—Fundamentals of Nuclear Energy....3
MATH/STAT 352—Probability & Statistics....3
Diversity course....3
Core Fine Arts course....3
TOTAL....15

Fourth Year—Spring Semester

ENGR 490—FE Exam....0
MSE 415—Materials Characterization....3
MSE 430—Phase Transformation and Kinetics....3
MSE 435—Corrosion Degradation of Nuclear Materials....3
MSE 472—Introduction to Ceramics....3
MSE 482—Design Project....3
TOTAL....15

* In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Bachelor of Science in Materials Science and Engineering

EXTRACTIVE METALLURGY EMPHASIS

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENT....42-44

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog....3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I*....4

C. Natural Science—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I *....4
CHEM 202—General Chemistry for Scientists and Engineers II*....4

D. Social Sciences—3 credits-Select one:

Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog....3

NOTE: It is recommended (but not required) that MSE students select from ECON 102, ECON 103, RECO 202, or HON 220.

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. Must not be a skills course....3

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures....3
CH 202—The Modern World....3
CH 203—American Experiences and Constitutional Change....3

G. Capstone Courses—6 credits

MSE 450—Techniques of Process Design, Economics and Safety....3
MSE 482—Design Project....3

H. Diversity—3 credits

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog....3

II. ADDITIONAL SCHOOL REQUIREMENTS....0

III. MAJOR REQUIREMENTS....84

CHE 440—Reactor Engineering....3
CHE 451—Dynamic Process Modeling and Control....4
CEE/ME 241—Statics....3
CEE 372—Strength of Materials....3
CHE 245—Computer Applications in Chemical Engineering....3

EE 220—Circuits I 3
ENGR 301—Engineering Communications....3
ENGR 490—Fundamentals of Engineering Exam 0
MATH 182—Calculus II*....4
MATH 283 R—Calculus III*....4
MATH 285—Differential Equations* 3
MATH/STAT 352—Probability and Statistics....3
MSE 101—Introduction to Metallurgical Engineering I....2
MSE 102—Introduction to Metallurgical Engineering II 2
MSE 232—Principles of Metallurgical Engineering* 3
MSE 250—Elements of Material Science* 3
MSE 322—Mineral Processing I 3
MSE 324—Mineral Processing Lab 1
MSE 361—Thermodynamics of Materials 3
MSE 383—Transport in Materials Systems 3
MSE 410—Extractive Metallurgy I-Pyrometallurgy 3
MSE 411—Pyrometallurgy Laboratory....1
MSE 415—Materials Characterization....3
MSE 431—Extractive Metallurgy II-Hydrometallurgy 3
MSE 450—See Core Curriculum Capstone
MSE 460—Physical Metallurgy I 4
MSE 470—Polymeric and Composite Materials 3
MSE 472—Introduction to Ceramics....3
MSE 482—See Core Curriculum Capstone
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 180L—Physics for Scientists & Engineers Lab I*....1
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 181L—Physics for Scientists & Engineers Lab II* 1

IV. MINOR REQUIREMENTS....0

V. ELECTIVES 0**

** If a student places out of any courses, the student must take additional open elective credits, such that 128 credits are completed for the major. The open electives must be approved by the departmental advisor. This requirement does not apply to AP credits earned or approved transfer credits.

VI. TOTAL CREDITS....126

VII. RECOMMENDED SCHEDULE

First Year—Fall Semester
CHEM 201—General Chemistry for Scientists and Engineers I*....4
ENG 101—Composition I 3
MSE 101—Introduction to Metallurgical Engineering I....2
MATH 181—Calculus I* 4
Social Sciences (Core) 3
TOTAL 16

First Year—Spring Semester
CHEM 202—General Chemistry for Scientists and Engineers II* 4
ENG 102—Composition II....3
MSE 102—Introduction to Metallurgical Engineering II 2
MATH 182—Calculus II*....4
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 180L—Physics for Scientists and Engineers Lab I* ..1
TOTAL 17

Second Year—Fall Semester
CEE/ME 241—Statics....3
MSE 232—Principles of Metallurgical Engineering*....3
MSE 250—Elements of Material Science* 3
MATH 283 R—Calculus III*....4
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 181L—Physics for Scientists and Engineers Lab II* .1
TOTAL 17

Second Year—Spring Semester
CHE 245—Computer Applications in Chemical Engineering 3
EE 220—Circuits I....3
ENGR 301—Engineering Communications....3
MSE 322—Mineral Processing I 3
MSE 324—Mineral Processing Lab....1
MATH 285—Differential Equations* 3
TOTAL 16

NOTE: If a student starts the Third Year - Fall Semester in an Odd Year follow below:

Third Year—Fall Semester
CEE 372—Strength of Materials....3
CH 201—Ancient and Medieval Cultures....3
MSE 460—Physical Metallurgy I 4
MSE 383—Transport in Materials Systems 3
MSE 361—Thermodynamics of Materials....3
TOTAL 16

Third Year—Spring Semester
MSE 415—Materials Characterization....3
MSE 431—Hydrometallurgy....3
MSE 472—Introduction to Ceramics....3
MATH/STAT 352—Probability and Statistics....3
Diversity (Core)....3
TOTAL 15

Fourth Year—Fall Semester
CH 202—The Modern World 3
CHE 440—Reactor Engineering....3
MSE 410—Extractive Metallurgy I-Pyrometallurgy 3
MSE 411—Pyrometallurgy Lab 1
MSE 450—Techniques of Process Design, Economics and Safety....3
TOTAL 13

Fourth Year—Spring Semester
CHE 451—Dynamic Process Modeling and Control 4
CH 203—American Experiences and Constitutional Change....3
ENGR 490—Fundamentals of Engineering Exam 0
MSE 482—Design Project....3
MSE 470—Polymeric and Composite Materials 3
Fine Arts (Core)....3
TOTAL 16

NOTE: If a student starts the Third Year - Fall Semester in an Even Year follow below:

Third Year—Fall Semester
CEE 372—Strength of Materials....3
CH 201—Ancient and Medieval Cultures....3
MSE 460—Physical Metallurgy I 4
MSE 383—Transport in Materials Systems 3
MSE 361—Thermodynamics of Materials....3
TOTAL 16

Third Year—Spring Semester
CH 202—The Modern World 3
MSE 431—Hydrometallurgy....3
MSE 470—Polymeric and Composite Materials 3
MATH/STAT 352—Probability and Statistics....3

Diversity (Core).....3
TOTAL.....15

Fourth Year—Fall Semester

CH 203—American Experiences and Constitutional Change.....3
CHE 440—Reactor Engineering.....3
MSE 410—Extractive Metallurgy I-Pyrometallurgy.....3
MSE 411—Pyrometallurgy Lab.....1
MSE 450—Techniques of Process Design, Economics and Safety.....3
Fine Arts (Core).....3
TOTAL.....16

Fourth Year—Spring Semester

CHE 451—Dynamic Process Modeling and Control.....4
ENGR 490—Fundamentals of Engineering Exam.....0
MSE 415—Materials Characterization.....3
MSE 482—Design Project.....3
MSE 472—Introduction to Ceramics.....3
TOTAL.....13

*In addition to the general university requirements of at least a "C" (2.0) average for graduation, MSE students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Minor in Extractive Metallurgy—19 credits

This minor is open to all students in an ABET-accredited engineering major except students in the Extractive Metallurgy emphasis of the B.S. in Materials Science and Engineering program. Courses may be used to satisfy the major and minor requirements simultaneously.

In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Extractive Metallurgy minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Courses required:

CS 135—Computer Science I.....3
CHEM 421—Physical Chemistry I.....3
MSE 232—Fundamentals of Engineering Calcs*.....3
MSE 250—Elements of Material Science*.....3
MSE 322/324—Mineral Processing I (with lab).....4
MSE 431—Extractive Metallurgy II - Hydrometallurgy.....3

Minor in Materials Science and Engineering—18 credits

In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Materials Science and Engineering minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

This minor is open to any engineering or physical science major except students majoring in the Materials Science and Engineering B.S. program, or the Materials Science and Engineering emphasis in the B.S. of Chemical Engineering program. Courses may be used to satisfy the major and minor requirements simultaneously.

Courses required:

MSE 250—Elements of Material Science*.....3
MSE 415—Materials Characterization.....3
MSE 430—Phase Transformations and Kinetics.....3

Plus nine credits from the following:

(other courses may be substituted with approval of department chair):
MSE 361—Thermodynamics of Materials **OR**
CHEM 421—Physical Chemistry I.....3
MSE 401—Corrosion of Metals.....3
MSE 416—X-Ray Diffraction.....3
MSE 433—Electronic, Magnetic and Optical Properties of Materials.....3
MSE 457—Introduction to Biomaterials.....3
MSE 460—Physical Metallurgy I.....4
MSE 461—Physical Metallurgy II.....4

Maximum of one of the following:

CHE 406—Introduction to Polymer Science & Engineering.....3
CHEM 449—Polymer Chemistry.....3
MSE 470—Polymeric and Composite Materials.....3
MSE 472—Introduction to Ceramics.....3
MSE 498—Special Topics in Materials.....3
ME 432—Materials.....3
ME 433—Introduction of Plasticity and Creep.....3
ME 446—Composite Materials.....3
PHYS 426—Introduction to Solid State Physics.....3

*In addition to the general university requirements of at least a "C" (2.0) average for graduation, MSE minor students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Advanced Degrees

The department offers programs leading to the master of science and doctor of philosophy degrees in materials science and engineering. The general university requirements for these advanced degrees are listed in the Graduate School section of this catalog.

Students must have a bachelor's degree from an accredited college or university to gain admission to graduate school. Students must meet at least one of the following requirements:

1. Hold a cumulative grade-point average of 2.75 for four years of undergraduate work;
2. Hold a cumulative grade-point average of 3.0 for the last two years of undergraduate work;
3. Earn acceptable scores on the verbal and quantitative portions of the Graduate Record Examination, and submit letters of recommendation from former instructors indicating the student's capability for advanced course work and research.

Prospective graduate students should contact the department chair for further information. Formal application is completed through the Graduate School.

The division offers several graduate fellowships, research assistantships and teaching assistantships. Requests for assistance should be submitted prior to March 15, but all applications will be considered regardless of the date they are submitted.

CIVIL AND ENVIRONMENTAL ENGINEERING

105 Scrugham Engineering-Mines
(775) 784-6937

The Department of Civil and Environmental Engineering offers two bachelors of science degrees: Civil Engineering and Environmental Engineering. In addition, it offers minors in each of these areas. These are described in the following sections.

The mission of the undergraduate civil and environmental engineering degree programs is to offer a broad fundamental education that emphasizes the creative and analytical skills necessary for the design, construction, and operation of the nation's civil and environmental infrastructure systems. To fulfill this mission, the following Educational Objectives are the cornerstones of our programs:

- Equip students with problem-solving skills and knowledge necessary for employment as civil/environmental engineers and in related job functions in consulting, industry, government, and academia;
- Produce graduates with sound background to undertake the analysis and design of civil/environmental infrastructure systems and function effectively in multidisciplinary teams;
- Provide competent coverage in selected civil and environmental

engineering disciplines so that the graduates can successfully acquire professional registration and those who are well qualified can pursue graduate studies;

- Graduate well-rounded engineers, who become valuable members of the society-at-large with a good understanding of social, ethical and technical issues, have effective communication skills, and are sensitive to the protection of environment; and
- Instill graduates with an awareness and appreciation of contemporary and complex issues, diverse cultural and humanistic issues, and the value of lifelong learning and professional development.

For graduate students, the mission includes the advancement of knowledge through cutting-edge research using fundamental science and engineering to explore complex and sometimes fragile systems.

Civil Engineering

Civil engineering includes the planning, analysis, design and construction of physical systems involving structures, soils, mapping, water resources, transportation, hydrology, water treatment and supply, wastewater treatment and reuse, materials, and water quality management.

Two cooperative training programs are available for civil engineering students. These programs are offered jointly with the Department of Civil and Environmental Engineering and two sponsoring agencies: the Nevada Department of Transportation (NDOT) and the Associated General Contractors (AGC) of Nevada. Both programs offer financial assistance to the student through summer employment with the participating organizations. For further information, contact the Department of Civil and Environmental Engineering.

Bachelor of Science in Civil Engineering

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 30-35

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101, but must take another three credit humanities course.

B. Mathematics—4 credits

MATH 181—Calculus I * 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I (CHEM 121* accepted) 4
PHYS 180—Physics for Scientists and Engineers I* 3
PHYS 180L—Physics for Scientists and Engineers LabI* ... 1

D. Social Science—3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog. 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog 3

NOTE: Must not be a skills course.

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses

Included in major requirements.

H. Diversity

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog.

NOTE: Students must take a three-credit course that satisfies the "Diversity" requirement. This can be a course that also satisfies either the "Fine Arts" or "Social Science" requirements.

II. ADDITIONAL COLLEGE REQUIREMENTS 0

III. MAJOR REQUIREMENTS 98

A. Communications—3 credits

ENGR 301—Engineering Communications 3

B. Basic Sciences—20 credits

CEE 371 R—Numerical Methods in Civil Engineering 3
CEE 389—Probability and Statistics for Civil Engineers 2
MATH 182—Calculus II* 4
MATH 283 R—Calculus III* 4
MATH 285—Differential Equations* 3
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 181L—Physics for Scientists and Engineers Laboratory II* 1

C. Engineering Science and Design—54 credits

CEE 101—Engineering Graphics 2
CEE 140 R—Introduction to Civil Engineering 3
CEE 121—Elementary Surveying 3
CEE 204 R—Introduction to Environmental Engineering 3
CEE 241—Statics* 3
CEE 362—Transportation Engineering 3
CEE 364 R—Engineering Hydrology 3
CEE 372—Strength of Materials* 3
CEE 377—Construction Materials* 4
CEE 381—Structural Analysis I* 3
CEE 388—Engineering Economy 2
CEE 390 R—Fundamentals of Environmental Engineering Design* 3
CEE 413—Water Resources Engineering 3
CEE 442—Fundamentals of Geotechnical Engineering* 4
CS 241—Intro to Computer Methods for Engineers 3
ENGR 490—Fundamentals of Engineering Exam 0
ME 242—Dynamics 3
ME 367—Elementary Fluid Mechanics **OR**
NRES 414—Hydrologic Fluid Dynamics 3
ME 311—Engineering Thermodynamics I **OR**
EE 220—Circuits I 3

D. Capstone Requirement—6 credits

CEE 427—Capstone Design Project 3
Emphasis Capstone**—Choose either CEE 431, CEE 443, CEE 456, CEE 457, **OR** CEE 481 3

E. Technical Electives—15 credits**

NOTE: List available from the department. At least two courses must contain design and all students are required to take either CEE 480 or CEE 481.

IV. ELECTIVES 0-3

V. TOTAL CREDITS 131

*Must complete these courses with at least a "C"

VI. RECOMMENDED SCHEDULE

First Year—Fall Semester

CEE 121—Elementary Surveying 3
CEE 140 R—Introduction to Civil Engineering 3
ENG 101—Composition I 3
MATH 181—Calculus I* 4

CHEM 201—General Chemistry for Scientists and Engineers I (CHEM 121* accepted) 4
TOTAL 17

First Year—Spring Semester

CEE 101—Engineering Graphics 2
CS 241—Intro to Computer Methods for Engineers 3
ENG 102—Composition II 3
MATH 182—Calculus II* 4
PHYS 180—Physics for Scientists and Engineers I* 3
PHYS 180L—Physics for Scientists & Engineers Lab I* 1
TOTAL 16

Second Year—Fall Semester

CEE 204 R—Introduction to Environmental Engineering .3
CEE 241— Statics* 3
MATH 283 R—Calculus III* 4
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 181L—Physics for Scientists and Engineers Lab II* 1
Core Curriculum Fine Arts/Diversity Course....3
TOTAL 17

Second Year—Spring Semester

CEE 372—Strength of Materials* 3
CEE 388—Engineering Economy 2
CEE 390 R—Fundamentals of Environmental Engineering Design* 3
CH 201—Ancient and Medieval Cultures....3
MATH 285—Differential Equations * 3
ME 242—Dynamics....3
TOTAL 17

Third Year—Fall Semester

CEE 364 R—Engineering Hydrology 3
CEE 377—Construction Materials* 4
CEE 381—Structural Analysis I* 3
CEE 389—Probability and Statistics for Civil Engineers 2
ENGR 301—Engineering Communications....3
ME 367—Elementary Fluid Mechanics **OR**
NRES 414—Hydrologic Fluid Dynamics 3
TOTAL 18

Third Year—Spring Semester

CEE 362—Transportation Engineering 3
CEE 371 R—Numerical Methods in Civil Engineering 3
CEE 413—Water Resources Engineering....3
CEE 442—Fundamentals of Geotechnical Engineering* ...4
CEE 480—Structural Concrete Design **OR**
CEE 481—Structural Steel Design**....3
TOTAL 16

Fourth Year

CEE 427—Capstone Design Project (Fall) 3
CH 202—The Modern World 3
EE 220—Circuits I **OR**
ME 311—Engineering Thermodynamics I....3
Emphasis Capstone**....3
ENGR 490—Fundamentals of Engineering Exam (Fall) 0
CH 203—American Experiences and Constitutional Change....3
Technical Electives** 12
Core Curriculum Social Science Elective....3
TOTAL 30

*In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

**Total number of credits is 18 for the Emphasis Capstone plus technical electives including CEE 480 and/or CEE 481.

Students enrolled in civil and environmental engineering internship programs are required to take a one-credit seminar course (CEE 225, 325, 425) at the appropriate level each summer they are enrolled in the program. These credits are in addition to the total required for other engineering students.

Class attendance is mandatory in all civil and environmental engineering courses. Civil engineering students who need to repeat courses to meet the minimum grade-point average requirement set by the university or the college are allowed to repeat only those courses in which they received a grade lower than a "C" (2.0).

It is the policy of the Department of Civil and Environmental Engineering to not accept transfer courses from outside the NSHE system with grades lower than a "C-".

Minor in Civil Engineering—18 credits

The following requirements apply to the minor program in civil engineering.

1. At least 18 credits of formal courses must be completed in the minor department, 12 credits of which are upper-division courses approved by the chair of both the minor and major departments.
2. The 12 credits of upper-division courses in the minor department must be in addition to the credits completed in upper-division required courses in the major department. Course requirements are specified by the curriculum of the major department.
3. In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Civil Engineering minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Environmental Engineering

The Environmental Engineering Program offered within the Department of Civil and Environmental Engineering leads to the bachelor of science degree in environmental engineering. Environmental engineers have taken an increasingly important role in the application of engineering and scientific principles used to protect and preserve human health and the environment and to improve the quality of life. Environmental engineers design and provide facilities for the treatment of municipal and industrial wastes. They design, construct and operate treatment systems that purify water for drinking, industrial and recreational uses. They develop and implement models that describe the transport and removal of contaminants in the environment. Solid, toxic and hazardous waste management strategies are also developed and implemented by environmental engineers. Water resources and management, environmental policy, environmental chemistry and biology, systems ecology and wetland ecology are also important aspects of the environmental engineering profession.

Bachelor of Science in Environmental Engineering

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 30-35

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog....3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101, but must take another three credit humanities course.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I (CHEM 121* accepted) 4
PHYS 180—Physics for Scientists and Engineers I* 3
PHYS 180L—Physics for Scientists and Engineers Laboratory I* 1

D. Social Science—3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog. 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog....3

NOTE: Must not be a skills course.

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses

Included in major requirements.

H. Diversity

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog.

NOTE: Students must take a three-credit course that satisfies the "Diversity" requirement. This can be a course that also satisfies either the "Fine Arts" or "Social Science" requirements.

II. ADDITIONAL COLLEGE REQUIREMENTS....0

III. MAJOR REQUIREMENTS....97

A. Communications—3 credits

ENGR 301—Engineering Communications....3

B. Basic Sciences—30 credits

BIOL 190—General Biology 3
CEE 389—Probability and Statistics for Civil Engineers 2
CHEM 220A—Introductory Organic Chemistry Lecture....3
CHEM 202—General Chemistry for Scientists and Engineers II (CHEM 122 accepted) 4
MATH 182—Calculus II*....4
MATH 283 R—Calculus III*....4
MATH 285—Differential Equations* 3
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 181L—Physics for Scientists and Engineers Laboratory II*....1
Restricted Earth Science Elective....3

Select ONE:

ATMS 411—Introduction to Atmospheric Physics
NRES 422—Soil Physics

C. Engineering Science and Design—55 credits

ATMS 412—Introduction to Air Pollution....3
CEE 101—Engineering Graphics....2
CEE 204 R—Introduction to Environmental Engineering ..3
CEE 241—Statics*....3
CEE 364 R—Engineering Hydrology 3
CEE 388—Engineering Economy....2
CEE 390 R—Fundamentals of Environmental Engineering Design* 3
CEE 404—Open Channel Flow....3
CEE 413—Water Resources Engineering*....3
CEE 417—Introduction to Environmental Quality and Analysis....3
CEE 418—Principles of Water Quality Modeling 3
CEE 453—Environmental Microbiology 3
CEE 456—Design of Water Treatment Facilities (Capstone)* 3
CEE 457—Design of Wastewater Treatment Facilities (Capstone)* 3
CEE 458—Fundamentals of Environmental Chemistry 3
CEE 459—Hazardous and Solid Waste Management and Control*....3
CHEM 421—Physical Chemistry I....3
CS 241—Intro to Computer Methods for Engineers....3
ENGR 490—Fundamentals of Engineering Exam 0
ME 367—Elementary Fluid Mechanics **OR**
NRES 414—Hydrologic Fluid Dynamics....3

D. Technical Electives—9 credits

NOTE: List available from the department.

IV. MINOR REQUIREMENTS....0

V. ELECTIVES....0-3

VI. TOTAL CREDITS....130

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—Fall Semester

CHEM 201—General Chemistry for Scientists and Engineers I (CHEM 121* accepted) 4
ENG 101—Composition I 3
MATH 181—Calculus I* 4
Core Curriculum Social Science and/or Diversity Course..3
Core Curriculum Fine Arts and/or Diversity Course....3
TOTAL 17

First Year—Spring Semester

CEE 101—Engineering Graphics 2
CHEM 202—General Chemistry for Scientists and Engineers II (CHEM 122 accepted) 4
ENG 102—Composition II 3
MATH 182—Calculus II *....4
PHYS 180—Physics for Scientists and Engineers I *....3
PHYS 180L—Physics for Scientists & Engineers Lab I* 1
TOTAL 17

Second Year—Fall Semester

CEE 204 R—Introduction to Environmental Engineering .3
CEE 241—Statics* 3
CS 241—Intro to Computer Methods for Engineers....3
MATH 283 R—Calculus III* 4
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 181L—Physics for Scientists and Engineers Lab II* 1
TOTAL 17

Second Year—Spring Semester

BIOL 190—General Biology....3
CH 201—Ancient and Medieval Cultures....3
CHEM 220A—Introductory Organic Chemistry Lecture..3
CEE 388—Engineering Economy....2
MATH 285—Differential Equations* 3
CEE 390 R—Fundamentals of Environmental Engineering Design*....3
TOTAL 17

Third Year—Fall Semester

CH 202—The Modern World....3
CEE 364 R—Engineering Hydrology....3
CEE 389—Probability and Statistics for Civil Engineers 2
CEE 453—Environmental Microbiology 3
CHEM 421—Physical Chemistry I....3
ME 367—Elementary Fluid Mechanics **OR**
NRES 414—Hydrologic Fluid Dynamics....3
TOTAL 17

Third Year—Spring Semester

CEE 413—Water Resources Engineering*....3
CEE 418—Principles of Water Quality Modeling 3
ENGR 301—Engineering Communications 3

Technical Elective or Earth Science Elective.....3
Technical Elective.....3
TOTAL.....15

Fourth Year—Fall Semester

ATMS 412—Introduction to Air Pollution.....3
CEE 404—Open Channel Flow.....3
CEE 417—Introduction to Environmental Quality and Analysis.....3
CEE 456—Design of Water Treatment Facilities*.....3
CEE 458—Fundamentals of Environmental Chemistry.....3
ENGR 490—Fundamentals of Engineering Exam.....0
TOTAL.....15

Fourth Year—Spring Semester

CEE 457—Design of Wastewater Treatment Facilities*.....3
CEE 459—Hazardous and Solid Waste Management and Control*.....3
CH 203—American Experiences and Constitutional Change.....3
Technical Elective or Earth Science Elective.....3
Technical Elective.....3
TOTAL.....15

*In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Class attendance is mandatory in all civil and environmental engineering courses. Civil/environmental engineering students who need to repeat courses to meet the minimum grade-point average requirement set by the university or the college are allowed to repeat only those courses in which they received a grade lower than a "C" (2.0).

It is the policy of the Department of Civil and Environmental Engineering not to accept transfer courses from outside the NSHE system with grades lower than a "C-".

Minor in Environmental Engineering—18 credits

The following requirements apply to the minor program in environmental engineering.

1. At least 18 credits of formal courses must be completed in the minor department, 12 credits of which are upper-division courses approved by the chair of both the minor and major departments.
2. The 12 credits of upper-division courses in the minor department must be in addition to the credits completed in upper-division required courses in the major department. Course requirements are specified by the curriculum of the major department.
3. In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Environmental Engineering minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Graduate Program

Continuing education beyond the bachelor's degree is recommended for prospective civil and environmental engineering professionals. The master's degree programs are a recommended course of study for civil and environmental engineers. The department offers programs leading to the master of science degree and the doctor of philosophy degree in civil and environmental engineering. In consultation with an advisor, students take courses with specialization in structures, soil mechanics and foundations, highway materials, transportation engineering, or environmental engineering. Both Plan A (requiring the completion of a thesis) and Plan B (nonthesis) study opportunities are available for the master of science degree program. Specific departmental requirements for the masters and doctorate programs may be obtained from the Department of Civil and Environmental Engineering.

The department also participates in the interdisciplinary master of science degree with a major in hydrologic sciences in cooperation with several other departments. At the doctorate level, the department participates in an interdisciplinary program in hydrologic sciences. For further information about the programs, refer to the Interdisciplinary and Special Programs section of this catalog.

Teaching and research assistantships are available in civil and environmental engineering. Applications for assistantships are due by February 15 for the fall semester and by October 15 for the spring semester.

COMPUTER SCIENCE AND ENGINEERING

242 Scrugham Engineering
(775) 784-6974

The department offers courses leading to undergraduate and graduate degrees: the bachelor of science in computer science, the bachelor of science in computer and information engineering, the master of science in computer science, the master of science in computer engineering and the doctor of philosophy in computer science and engineering.

Computer Science

Computer Science, the science of solving problems with the aid of a computer, is a young discipline. It is positioned at the crossroads of many fields in mathematics, science and engineering and binds theory, abstraction, and design of computing devices, programs, and systems. Computer science encompasses the methodology, tools and techniques, and theory of how information is derived, stored, manipulated, and communicated. Because of its importance to our world, computer science has become an extremely exciting field of study that continues to grow at a rapid pace.

The objectives of the Computer Science Program are that within 3-5 years of graduation our graduates will:

- Be employed as computer science professionals beyond entry level positions or be making satisfactory progress in graduate programs.
- Have peer-recognized expertise together with the ability to articulate that expertise as computer science professionals.
- Apply good analytic, design, and implementation skills required to formulate and solve computer science problems.
- Demonstrate that they can function, communicate, collaborate and continue to learn effectively as ethically and socially responsible computer science professionals.

Bachelor of Science in Computer Science

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS.....33-38

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog.....3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101, but must complete 3 additional credits of general electives.

B. Mathematics—4 credits

MATH 181—Calculus I*.....4

C. Natural Sciences—8 credits

CHEM 121*—General Chemistry I **OR**
CHEM 201—General Chemistry for Scientists and Engineers I.....4
PHYS 180—Physics for Scientists and Engineers I*.....3
PHYS 180L—Physics for Scientists and Engineers Laboratory I*.....1

D. Social Sciences—3 credits
Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog. 3

E. Fine Arts—3 credits
Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. 3
NOTE: Must not be a skills course.

F. Core Humanities—9 credits
CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses
Included in major requirements.

H. Diversity—3 credits
Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. 3

II. ADDITIONAL COLLEGE REQUIREMENTS....0

III. MAJOR REQUIREMENTS....80

Communication—3 credits
ENGR 301—Engineering Communication....3

Computer Science—47 credits
CPE 201 R—Introduction to Computer Engineering....4
CPE 301 R—Microprocessors System Design....4
CPE 411 R—Digital Computer Architecture and Design....3
CS 105—Introduction to Computing....3
CS 135—Computer Science I* 3
CS 202—Computer Science II* 3
CS 302—Data Structures*....3
CS 326 R—Programming Languages 3
CS 365 R—Mathematics of Computer Science....3
CS 425 R—Software Engineering 3
CS 426—Senior Projects in Computer Science 3
CS 446—Principles of Operating Systems 3
CS 456—Automata and Formal Languages....3
CS 477 R—Analysis of Algorithms 3
CS 494—Internship in Computer Science....3

Physics—4 credits
PHYS 181—Physics for Scientists and Engineers II* 3
PHYS 181L—Physics for Scientists & Engineers Lab II* 1

Mathematics—14 credits
MATH 182—Calculus II *....4
MATH 283 R—Calculus III* 4
MATH 330—Linear Algebra I 3
MATH/STAT 352—Probability and Statistics 3

Technical Electives—Select 12 credits
Select these credits from 300- or 400-level computer science, computer engineering, mathematics or electrical engineering courses that are not already required. At least nine of the twelve credits must be in computer science or computer engineering.

IV. MINOR REQUIREMENTS....0

V. ELECTIVES....10-15
Electives must be chosen in such a way that they complete a minor in another field or have 9 credits of upper division courses.

VI. TOTAL CREDITS....128

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—Fall Semester
CS 105—Introduction to Computing 3
CS 135—Computer Science I* 3
ENG 101—Composition I 3
MATH 181—Calculus I* 4
Core Curriculum Fine Arts Elective 3
TOTAL....16

First Year—Spring Semester
CS 202—Computer Science II* 3
ECON 102—Principles of Microeconomics **OR**
Other core social science elective....3
ENG 102—Composition II....3
MATH 182—Calculus II*....4
PHYS 180—Physics for Scientists and Engineers I*....3
PHYS 180L—Physics for Scientists & Engineers Lab I* 1
TOTAL....17

Second Year—Fall Semester
CPE 201 R—Introduction to Computer Engineering....4
CH 201—Ancient and Medieval Cultures....3
MATH 283 R—Calculus III *....4
PHYS 181—Physics for Scientists and Engineers II *....3
PHYS 181L—Physics for Scientists and Engineers Lab II *1
General Elective....3
TOTAL....18

Second Year—Spring Semester
CH 202—The Modern World 3
CHEM 121*—General Chemistry I **OR**
CHEM 201—General Chemistry for Scientists and Engineers I....4
CS 302—Data Structures*....3
MATH 330—Linear Algebra I....3
MATH/STAT 352—Probability and Statistics....3
TOTAL....16

Third Year—Fall Semester
CH 203—American Experiences and Constitutional Change....3
CPE 301 R—Microprocessors System Design....4
CS 326 R—Programming Languages....3
CS 365 R—Mathematics of Computer Science 3
General Elective....3
TOTAL....16

Third Year—Spring Semester
CS 446—Principles of Operating Systems....3
CS 456—Automata and Formal Languages 3
CS 494—Internship in Computer Science....3
ENGR 301—Engineering Communications....3
CPE 411 R—Digital Computer Architecture and Design....3
TOTAL....15

Fourth Year—Fall Semester
CS 425 R—Software Engineering 3
CS 477 R—Analysis of Algorithms 3
Core Curriculum Diversity Course 3
Technical Elective 6
TOTAL....15

Fourth Year—Spring Semester
CS 426—Senior Projects in Computer Science 3
General Elective....6
Technical Electives....6
TOTAL....15

* In addition to the general university requirements of at least a "C"

(2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Computer and Information Engineering

Computer and information engineers work with both the hardware and software aspects of computing and communications systems design and development. They build prototypes and solve computer problems to enable computer technology to be optimally utilized.

The curriculum is based upon the concept that there are four fundamental areas supporting Computer and Information Engineering. These are: 1) computer architecture, 2) software engineering, 3) computer networking and communications, and 4) electronic circuits. Consequently, the curriculum contains fundamental sequences of courses in these four areas. These sequences provide the solid foundation of Computer and Information Engineering education.

In addition to the four fundamental areas a practicing Computer and Information Engineer will need a depth of knowledge in an area related to his or her particular interest. The curriculum is designed so that 18-21 credits of emphasis area electives are available. Emphasis area elective credits must be taken as a unit in one of several emphasis areas. The credits comprising each emphasis area are defined by the department faculty and will be changed to reflect the changing needs of industry. Likewise, new emphasis areas will be added as they become necessary.

The objectives of the Computer and Information Engineering Program are that within 3 to 5 years of graduation our graduates will:

- be employed as computer engineering professionals beyond entry level positions or be making satisfactory progress in graduate programs·
- have peer-recognized expertise together with the ability to articulate that expertise as computer engineering professionals
- apply good analytic, design, and implementation skills required to formulate and solve computer engineering problems·
- demonstrate that they can function, communicate, collaborate, and continue to learn effectively as ethically and socially responsible computer engineering professionals.

Bachelor of Science in Computer and Information Engineering

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 33-38

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I **OR**
CHEM 121—General Chemistry I* 4
PHYS 180—Physics for Scientists and Engineers I* 3
PHYS 180L—Physics for Scientists & Engineers Lab I* 1

D. Social Sciences—3 credits

ECON 102—Principles of Microeconomics 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. 3

NOTE: Must not be a skills course.

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses

Included in major requirements.

H. Diversity—3 credits

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. 3

II. ADDITIONAL COLLEGE REQUIREMENTS 0

III. MAJOR REQUIREMENTS 92-95

A. Communications—3 credits

ENGR 301—Engineering Communication 3

B. Computer Science—47 credits

CPE 201 R—Introduction to Computer Engineering 4
CPE 301 R—Microprocessors System Design 4
CPE 400—Computer Communications Networks 3
CPE 401—Computer Network Systems 3
CPE 406—Real Time Computing Systems 3
CPE 411 R—Digital Computer Architecture and Design 3
CPE 426—Senior Projects in Computer Engineering 3
CPE 494—Internship in Computer Engineering 3
CS 105—Introduction to Computing 3
CS 135—Computer Science I* 3
CS 202—Computer Science II* 3
CS 302—Data Structures* 3
CS 365 R—Mathematics of Computer Science 3
CS 425 R—Software Engineering 3
CS 446—Principles of Operating Systems 3

C. Electrical Engineering—7 credits

EE 220—Circuits I 3
EE 220L—Circuits I Laboratory 1
EE 362—Signals and Systems 3
ENGR 490—Fundamentals of Engineering Exam 0

D. Physics—3 credits

PHYS 181—Physics for Scientists and Engineers II* 3

E. Mathematics—14 credits

MATH 182—Calculus II* 4
MATH 283 R—Calculus III* 4
MATH 330—Linear Algebra 3
MATH/STAT 352—Probability and Statistics 3

F. Emphasis Area Electives—18-21 credits

The emphasis area elective credits must be taken as a unit consisting of an emphasis area defined by the department.

IV. MINOR REQUIREMENTS 0

V. TOTAL CREDITS 128

*Must complete these courses with at least a "C"

VI. RECOMMENDED SCHEDULE

Freshman Year—Fall Semester

CS 105—Introduction to Computing 3
CS 135—Computer Science I* 3
ENG 101—Composition I 3
MATH 181—Calculus I* 4
Core Curriculum Fine Arts Elective 3
TOTAL 16

Freshman Year—Spring Semester
- CS 202—Computer Science II*....3
- ECON 102—Principles of Microeconomics 3
- ENG 102—Composition II 3
- MATH 182—Calculus II* 4
- PHYS 180—Physics for Scientists and Engineers I 3
- PHYS 180L—Physics for Scientists and Engineers Laboratory I* 1
- TOTAL 17

Second Year—Fall Semester
- CPE 201 R—Introduction to Computer Engineering 4
- CHEM 201—General Chemistry for Scientists and Engineers I **OR**
- CHEM 121—General Chemistry I*....4
- MATH 283 R—Calculus III* 4
- PHYS 181—Physics for Scientists and Engineers II....3
- TOTAL 15

Second Year—Spring Semester
- CH 201—Ancient and Medieval Cultures 3
- CPE 301 R—Microprocessors System Design....4
- CS 302—Data Structures*....3
- EE 220—Circuits I 3
- EE 220L—Circuits I Laboratory....1
- MATH 330—Linear Algebra....3
- TOTAL 17

Third Year—Fall Semester
- CPE 400—Computer Communications Networks....3
- CS 365 R—Mathematics of Computer Science 3
- EE 362—Signals and Systems....3
- ENGR 301—Engineering Communication....3
- MATH/STAT 352—Probability and Statistics 3
- TOTAL 15

Third Year—Spring Semester
- CH 202—The Modern World 3
- CPE 411 R—Digital Computer Architecture and Design...3
- CS 446—Principles of Operating Systems 3
- Emphasis Area Electives 6-9
- TOTAL 15-18

Fourth Year—Fall Semester
- CH 203—American Experiences and Constitutional Change 3
- CPE 494—Internship in Computer Engineering....3
- CS 425 R—Software Engineering....3
- CPE 406—Real Time Computing Systems....3
- ENGR 490—Fundamentals of Engineering Exam 0
- Emphasis Area Electives 6
- TOTAL 18

Fourth Year—Spring Semester
- CPE 401—Computer Networking Systems....3
- CPE 426—Senior Projects in Computer Engineering 3
- Diversity 3
- Emphasis Area Electives 6
- TOTAL 15

* In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Computer Science as a Second Major

The department offers computer science as a second major. This major is not open to students pursuing a major within the department. The course requirements for the major are:

Communication—3 credits
- ENGR 301—Engineering Communications....3

Computer Science—47 credits
- CPE 201 R—Introduction to Computer Engineering....4
- CPE 301 R—Microprocessors System Design....4
- CPE 411 R—Digital Computer Architecture and Design....3
- CS 105—Introduction to Computing....3
- CS 135—Computer Science I*....3
- CS 202—Computer Science II* 3
- CS 302—Data Structures*....3
- CS 326 R—Programming Languages....3
- CS 365 R—Mathematics for Computer Science....3
- CS 425 R—Software Engineering....3
- CS 426—Senior Projects in Computer Science 3
- CS 446—Principles of Operating Systems....3
- CS 456—Automata and Formal Languages....3
- CS 477 R—Analysis Algorithms 3
- CS 494—Internship in Computer Science....3

Technical Electives—Select 12 credits

Select these credits from 300- or 400-level computer science, computer engineering, mathematics or electrical engineering courses that are not already required. At least nine of the twelve credits must be in computer science or computer engineering that are not already required above.

Mathematics/Statistics—15 credits
- MATH 181—Calculus I*....4
- MATH 182—Calculus II* 4
- STAT/MATH 352—Probability and Statistics....3
- 4 credits above MATH 182....4

Science—12 credits

Coursework must include the equivalent of a two-semester sequence in a laboratory science for science or engineering students. The remaining coursework must be in another science that enhances the student's ability to apply the scientific method. May include credits required in another major chosen in consultation with advisor.

* In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirement courses.

Minor in Computer Science—23 credits

The computer science minor is open to all students at the university except those pursuing a major within the department. Required courses are CS 105, CS 135*, CS 202*, CS 302*, CPE 201 R, CPE 301 R. Students must also select one of CS 326 R or CS 446.

Students who complete the minor have a strong technical foundation upon which to build further expertise in computer science, and they can strengthen their understanding of the applications of computers in their selected fields.

In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Computer Science minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Minor in Digital Interactive Games—21 credits

The Department of Computer Science and Engineering offers a minor in Digital Interactive Games. This minor is open to all students at the university. The courses required for the minor are: CS 135*, CS 202*, CS 281 R, CS 381, and one of CS 481 or CPE 481. Students must also earn an additional six upper-division credits from the list of approved courses for this minor maintained on the Department's website, for a total of 21 credits.

Students who complete the minor have a technical foundation in the theory and practice of using computing principles to create digital

interactive games. In addition to the general university requirements of at least a "C" (2.00) GPA for graduation, all Digital Interactive Games minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Graduate Programs

The Department of Computer Science and Engineering offers graduate programs leading to the M.S. in Computer Science, M.S. in Computer Engineering, and Ph.D. in Computer Science and Engineering.

Students who are accepted into the graduate program are expected to meet requirements for a bachelor's degree in engineering, mathematics, or science, and have minimum experience that includes the equivalent of the computer science minor. The department accepts applications from students lacking this background if they show exceptional promise. The GRE is required for all applications and the TOEFL is required for international students. If admitted, students lacking sufficient background must complete prescribed prerequisite courses within the first year. Masters level students may choose Plan A (thesis) or Plan B (professional paper). More information about the graduate program is available on the department's web page at http://www.cse.unr.edu

Master of Science in Computer Science

The department offers an integrated course of study leading to the degree of master of science in computer science. Students investigate the theory, implementation and design of information processing systems and have the opportunity to become involved in many areas of research including artificial intelligence, computability, complexity, database systems, fuzzy systems, computer graphics, distributed and parallel systems, imaging and vision, computer networks, machine learning, neural networks, numerical analysis, operating systems, pattern recognition, programming languages, program specification, real-time scheduling, robotics, simulation and software engineering.

Master of Science in Computer Engineering

Computer engineering deals with the theory, implementation and design of computing and communication hardware and software systems. Applicants should have a B.S. in computer engineering, computer science, electrical engineering, or some other technical field. The program will consider applications from students lacking this background if they show exceptional promise; however, certain prerequisites may be required to be taken without graduate credit.

Doctor of Philosophy in Computer Science and Engineering

Doctoral students must complete the master of science in computer engineering, computer science or electrical engineering or equivalent prior to advancement to candidacy. All doctoral candidates must attend colloquia, participate in proposal writing and make presentations of their research. They must pass the written and oral portions of their comprehensive examinations which are used to demonstrate a mastery of the relevant topics, literature, development of research proposal, and communication of these to others. The three credits of comprehensive examination will be counted in the 72 credits required of a doctoral degree beyond the BA/BS degree and can be used to satisfy the 30 credits of required 700-level course work. Research interests of faculty include computer networks, computer vision and imaging, distributed and parallel algorithms, learning and recognition systems, robotic navigation and software engineering, among others.

ELECTRICAL AND BIOMEDICAL ENGINEERING

332 Scrugham Engineering-Mines
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UNDERGRADUATE CURRICULUM

The definition of an "electrical engineer" has expanded. Trained to be an expert thinker and problem solver, today's electrical engineer is as much in demand as ever. With communications, computers, networking and systems playing key roles in the operations of virtually all businesses today, electrical engineers can plan on being actively recruited for years to come. The undergraduate program is specifically formulated with three (3) educational objectives:

- **Depth.** Graduates apply knowledge in the practice or the advanced study of electrical engineering, including its scientific principles, rigorous analysis, and creative design.
- **Breadth.** Graduates apply knowledge including information on the most important current issues in electrical engineering for productive careers in the public or private sector or for the pursuit of graduate education.
- **Professionalism.** Graduates communicate clearly and work ethically and professionally in teams in a complex modern environment and engage in life-long learning to adapt to changes in the requirements of the profession.

Aware of the dynamic nature of the discipline, while at the same time cognizant of that body of knowledge which appears to be timeless, the Department of Electrical and Biomedical Engineering is continually in the process of evaluating and updating its curriculum. The Department of Electrical and Biomedical Engineering also cooperates with local industry to offer a number of summer internships for qualified undergraduate electrical engineering students. The curriculum for the bachelor of science in electrical engineering degree is listed below.

NOTE: The professional FE examination, administered by the state board of engineering registration, must be taken by all electrical engineering students before graduation during the senior year of study.

Bachelor of Science in Electrical Engineering

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 33-38

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog. 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I * 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I **OR**
CHEM 121—General Chemistry I* 4
PHYS 180—Physics for Scientists and Engineers I * 3
PHYS 180L—Physics for Scientists and Engineers Laboratory I* 1

D. Social Sciences—3 credits

ECON 102—Principles of Microeconomics 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. 3

NOTE: Must not be a skills course.

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses

Included in major requirements.

H. Diversity—3 credits

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. 3

II. ADDITIONAL COLLEGE REQUIREMENTS.....0

III. MAJOR REQUIREMENTS.....93-96

A. Communications—3 credits

ENGR 301—Engineering Communication.....3

B. Mathematics and Sciences—20 credits

CS 135—Computer Science I.....3
MATH 182—Calculus II *.....4
MATH 283 R—Calculus III *.....4
MATH 285—Differential Equations*.....3
MATH/STAT 352— Probability and Statistics.....3
PHYS 181—Physics for Scientists and Engineers II *.....3

C. Engineering Science & Design Courses—48 credits

CEE/ME 241—Statics.....3
CPE 201 R—Introduction to Computer Engineering.....4
CPE 301 R—Microprocessor Systems Design.....4
EE 191—Introduction to Electrical Engineering.....3
EE 220L—Circuits I Laboratory.....1
EE 220—Circuits I*.....3
EE 221—Circuits II.....3
EE 291—Computer Methods for Electrical Engineers **OR**
EE 240 – Fundamentals and Economics of Renewable and Nonrenewable Energy.....3
EE 320 RL—Electronics I Laboratory.....1
EE 320 R—Electronics I.....3
EE 330—Engineering Electromagnetics.....3
EE 340—Power System Fundamentals.....3
EE 370L—Control Systems I Laboratory.....1
EE 370 R—Control Systems I.....3
EE 362—Signals and Systems.....3
EE 490—Electrical Projects Laboratory (capstone).....3
EE 491—Engineering Design/Analysis (capstone).....4
ENGR 490—Fundamentals of Engineering Exam.....0

D. Science and Technical Electives—22 credits

IV. MINOR REQUIREMENTS.....0

V. TOTAL CREDITS.....129

*Must complete these courses with at least a "C"

VI. RECOMMENDED SCHEDULE

First Year—Fall Semester

CHEM 201—General Chemistry for Scientists and Engineers I **OR**
CHEM 121—General Chemistry I*.....4
EE 191—Introduction to Electrical Engineering.....3
ENG 101—Composition I.....3
MATH 181—Calculus I*.....4
Core Curriculum Fine Arts course.....3
TOTAL.....17

First Year—Spring Semester

CS 135—Computer Science I.....3
ECON 102—Principles of Microeconomics.....3
ENG 102—Composition II.....3
MATH 182—Calculus II*.....4
PHYS 180—Physics for Scientists and Engineers I *.....3
PHYS 180L—Physics for Scientists & Engineers Lab I*.....1
TOTAL.....17

Second Year—Fall Semester

CEE/ME 241—Statics.....3
EE 291—Computer Methods for Electrical Engineers **OR**
EE 240 – Fundamentals and Economics of Renewable and Nonrenewable Energy.....3
CPE 201 R—Introduction to Computer Engineering.....4
MATH 283 R—Calculus III*.....4
PHYS 181—Physics for Scientists and Engineers II*.....3
TOTAL.....17

Second Year—Spring Semester

EE 220L—Circuits I Laboratory.....1
EE 220—Circuits I*.....3
CPE 301 R—Microprocessor Systems Design.....4
CH 201—Ancient and Medieval Cultures.....3
MATH 285—Differential Equations *.....3
TOTAL.....14

Third Year—Fall Semester

EE 221—Circuits II.....3
EE 320L—Electronics I Laboratory.....1
EE 320 R—Electronics I.....3
EE 362—Signals and Systems.....3
CH 202—The Modern World.....3
MATH/STAT 352—Probability and Statistics.....3
TOTAL.....16

Third Year—Spring Semester

CH 203—American Experiences and Constitutional Change.....3
EE 330 R—Engineering Electromagnetics.....3
EE 370L—Control Systems I Laboratory.....1
EE 370 R—Control Systems I.....3
EE 340—Power System Fundamentals.....3
ENGR 301—Engineering Communication.....3
TOTAL.....16

Fourth Year—Fall Semester

EE 490—Electrical Projects Laboratory.....3
ENGR 490—Fundamentals of Engineering Exam.....0
Diversity course.....3
Technical Electives.....10
TOTAL.....16

Fourth Year—Spring Semester

EE 491—Engineering Design/Analysis.....4
Science or Technical Elective.....3
Technical Electives.....9
TOTAL.....16

* In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

NOTE: , 220L, 220, 221, CPE 201 R and 301 R are offered every semester; EE 191, EE 291, 320L, 320 R, 362 and 490 are offered during the fall semester; EE 330 R, 340, 370L, 370 and 491 are offered during the spring semester.

Science and Technical Electives

General Emphases

Senior-year technical electives consist of 22 credits. Eighteen of these credits must be electrical engineering credits chosen from courses in the six areas listed below. Students must have at least one course in the five areas of electronics, communications, control, fields, and power. Courses in each elective area are:

Communication: EE 410L, 410, 461 R, 480, 492G;

Computer: CPE 400, EE 426 R;

Control: EE 471, 472;

Electronics: EE 420, 421, 423, 424 R;

Fields: EE 433, 434 R, 435 R, 436 R, 436L;

Power: EE 440, 441, 442, 443, 444.

The remaining technical elective credits may include: Internship EE 296, 396, 496 (up to 3 credits), EE 492, 493 (up to 3 credits total), any EE course listed above under one of the six elective areas, or additional

technical courses pre-approved by the department.

Renewable Energy Emphasis

This emphasis, administered by the EBME Department, leads to a Bachelor of Science degree in electrical engineering. The program is designed for the student seeking a degree in electrical engineering with emphasis on renewable energy. The required courses are identical to those for a regular BS degree in EE with EE 240 replacing EE 291. The senior year technical electives consist of 22 credits. At least twelve of these credits must be taken from electrical engineering courses listed below: EE 440, EE 441, EE 442, EE 443, EE 444, EE 445R. The remaining technical elective credits may include: CEE 388, CEE 411, CHE 410 R, ME 311, ME 474, PSC 403B, Internship EE 296, EE 396, EE 496 (up to 3 credits) or additional technical courses pre-approved by the department.

Minor in Electrical Engineering—21 credits

For a minor in Electrical Engineering the student must take 21 credits in EE. The required courses are EE 220L, 220, 221, 362. The remaining 11 credits must be selected from EE courses. EE 191, 291, 296, 396, and 496 may not be included.

In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Electrical Engineering minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Graduate Programs

It is strongly recommended that prospective electrical engineering professionals take at least one year of graduate study. Both the undergraduate and graduate curricula at the university are designed to offer students the range of education needed for leadership in the profession, as well as knowledge of the physical sciences and basic professional techniques.

The electrical and biomedical engineering department offers graduate programs leading to both the master of science and the doctor of philosophy degrees in electrical and biomedical engineering. Primary areas of focus in the department include: image and signal processing, electromagnetics and microwaves, and power.

Graduate course work and research opportunities are available in the following areas:

- Wireless Networks and Communications
- Computer Design and Applications
- Synthetic Aperture Radar Simulation
- Biomedical Image Processing
- Microprocessor Design and Applications
- Antenna Design and Analysis
- Radar Cross Section Measurement
- Microwave Devices and Distribution Systems
- Bioelectromagnetics
- Optical Fiber Communications and Sensors
- Microwave Integrated Circuits
- Power System Simulation, Planning and Protection
- Renewable Energy Integration and Smart Grid Applications
- Power Electronics and Electric Drives
- Power Conversions
- Control Systems
- Biosensors and Actuators
- Integrated Bio-analytical Systems

General requirements for graduate degrees are determined by the Graduate School and are listed in the Graduate School section of this catalog.

Required Graduate Classes

All electrical engineering graduate students are required to complete the following two classes:

EE 790—Seminar
EE 782—Random Signal Analysis and Estimation Theory

Master's degree candidates must select a graduate committee before completion of more than nine credit hours. The graduate student's committee recommends specific programs of study based on the needs and interests of the student. Both Plan A (requiring the completion of a thesis) and Plan B (nonthesis) study opportunities are available in the master of science degree program.

Doctor of philosophy degree candidates must successfully complete a written qualifying examination administered by the department. The examination includes separate exams in three of six major study areas in electrical engineering. Additionally, the Ph.D. candidate must pass a final comprehensive exam administered by his or her committee. The comprehensive examination can be from 1 to 3 credits and is above the required 72 credits beyond the B.S. The comprehensive examination credits cannot be used to fulfill the 30 credits of 700-level course work.

Two fellowships (Turner and Dickinson) and a number of teaching and research assistantships are typically available in electrical engineering. They are awarded on a competitive basis. For more information, contact the department chairman or the Graduate School dean's office.

Engineering Physics

The engineering physics program, administered by the electrical and biomedical engineering department, leads to the bachelor of science in engineering physics degree. The program is designed for the student who desires a background in engineering science, based on a firm foundation of physics, as well as an introduction to computer science. The program is also for students who would like to pursue graduate studies in physics or engineering.

Bachelor of Science in Engineering Physics

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 33-38

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog. 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I 4
PHYS 180—Physics for Scientists & Engineers I* 3
PHYS 180L—Physics for Scientists & Engineers Lab I* 1

D. Social Sciences—3 credits

Refer to the "Social Sciences" section of the Core Curriculum chapter in this catalog. 3

E. Fine Arts—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog. 3

NOTE: Must not be a skills course.

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses

Included in major requirements.

H. Diversity—3 credits

Refer to the "Diversity" section of the Core Curriculum chapter of this catalog. 3

II. ADDITIONAL COLLEGE REQUIREMENTS 0

III. MAJOR REQUIREMENTS....89

A. Additional Mathematics and Sciences—63 credits

CHEM 202—General Chemistry for Scientists and Engineers II....4
CS 135—Computer Science I*....3
CS 202—Computer Science II....3
MATH 182—Calculus II*....4
MATH 283 R—Calculus III*....4
MATH 285—Differential Equations*....3
MATH/STAT 352—Probability and Statistics....3
PHYS 181—Physics for Scientists & Engineers I*....3
PHYS 181L—Physics for Scientists & Engineers Lab I *....1
PHYS 182—Physics for Scientists & Engineers II....3
PHYS 182L—Physics for Scientists & Engineers Lab II*....1
PHYS 301—Mathematical Methods Physics....3
PHYS 323—Intermediate Laboratory with Shop Experience....1
PHYS 351—Classical Mechanics....3
PHYS 400—Energy: Principles, Sources and Problems (capstone)....3
PHYS 421 R—Quantum Mechanics....3
PHYS 422 R—Applications of Quantum Mechanics....3
PHYS 425—Thermal and Statistical Physics....3
PHYS 461—Modern Optics and Photonics....3
PHYS 473—Electricity and Magnetism....3
Physics electives....6

B. Engineering Courses—20 credits

CPE 201 R—Introduction to Computer Engineering....4
EE 220—Circuits I*....3
EE 221—Circuits II....3
EE 320 R—Electronics I....3
EE 370 R—Control Systems I....3
EE 491—Engineering Design/Analysis (capstone)....4

C. Science and Technical Electives—6 credits

Advisor approval required for electives....6

IV. MINOR REQUIREMENTS....0

V. ELECTIVES....1-6

VI. TOTAL CREDITS....129

*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—Fall Semester

CHEM 201—General Chemistry for Scientists and Engineers I....4
CS 135—Computer Science I*....3
ENG 101—Composition I....3
MATH 181—Calculus I*....4
TOTAL....14

First Year—Spring Semester

CHEM 202—General Chemistry for Scientists and Engineers II....4
CS 202—Computer Science II....3
ENG 102—Composition II....3
MATH 182—Calculus II*....4
PHYS 180—Physics for Scientists and Engineers I *....3
PHYS 180L—Physics for Scientists and Engineers Laboratory I*....1
TOTAL....18

Second Year—Fall Semester

CH 201—Ancient and Medieval Cultures....3
CPE 201 R—Introduction to Computer Engineering....4
MATH 283 R—Calculus III*....4
MATH/STAT 352—Probability and Statistics....3
PHYS 181—Physics for Scientists and Engineers II*....3
PHYS 181L—Physics for Scientists and Engineers Laboratory II*....1
TOTAL....18

Second Year—Spring Semester

CH 202—The Modern World....3
EE 220—Circuits I*....3
MATH 285—Differential Equations*....3
PHYS 182—Physics for Scientists and Engineers III....3
PHYS 182L—Physics for Scientists and Engineers Laboratory III....1
PHYS 323—Intermediate Physics Laboratory....1
TOTAL....14

Third Year—Fall Semester

CH 203—American Experiences and Constitutional Change....3
EE 221—Circuits II....3
EE 320 R—Electronics I....3
PHYS 301—Mathematical Methods....3
PHYS 351—Classical Mechanics....3
TOTAL....15

Third Year—Spring Semester

Core Curriculum Fine Arts course....3
EE 370 R—Control Systems I....3
PHYS 421 R—Quantum Mechanics....3
PHYS 425—Thermal and Statistical Physics....3
PHYS 473—Electricity and Magnetism....3
TOTAL....15

Fourth Year—Fall Semester

PHYS 400—Energy....3
PHYS 422 R—Applications of Quantum Mechanics....3
PHYS 423—Advanced Physics Laboratory....3
Core Curriculum Social Sciences course....3
Science or technical electives....3
Physics elective....3
TOTAL....18

Fourth Year—Spring Semester

EE 491—Engineering Design/Analysis....4
PHYS 461—Optics and Photonics....3
Core Curriculum Diversity course....3
Physics elective....3
Science or Technical elective....3
TOTAL....16

* In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Minor in Engineering Physics—18 credits

The following requirements apply to the minor program in engineering physics.

1. At least 18 credits of formal courses must be completed in the minor department, 12 credits of which are upper-division courses approved by the chairman of both the minor and major departments.
2. The 12 credits of upper-division courses in the minor department must be in addition to the credits completed in upper-division required courses in the major department. Course requirements are specified by the curriculum of the major department.
3. In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Engineering Physics minors must earn at least a "C" in those minor courses designated with

an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

MECHANICAL ENGINEERING

200 Palmer Engineering
(775) 784-6931

UNDERGRADUATE CURRICULUM

Mechanical engineers work in all segments of the economy. Challenging opportunities exist in both heavy and light manufacturing, natural resource development, utilities, aerospace industries, medicine, management and government.

The undergraduate curriculum is broadly based to accommodate a variety of career goals. Students take a core of required courses in engineering, the humanities, mathematics and science, as well as supplementary elective courses. These courses introduce basic engineering science and design concepts and provide students with the opportunity to develop specific career interests. While completing the mechanical engineering baccalaureate degree, our graduates acquire important skills: they become able to communicate effectively; design mechanical systems; and conduct independent study to obtain or develop technical information they themselves require to know. In addition, they become prepared to pursue further professional study in mechanical engineering or related areas, or in medicine, business or law.

Our program's educational objectives are defined as the expected accomplishments of our graduates during the first several years following graduation. They directly support the University of Nevada, Reno and the College of Engineering missions. Our program educational objectives are that our graduates will be:

- proficient in performing entry-level mechanical engineering analysis and design;
- able to define, design, execute, and analyze experiments with minimal supervision;
- able to communicate effectively, verbally and in writing;
- successful in pursuit of graduate studies at UNR and other institutions.

Because many upper-division mechanical engineering courses have strict prerequisites, it is important that courses are completed in the order listed below. Students who do not meet prerequisites for MATH 181 should attend summer school prior to their first semester. The mechanical engineering curriculum meets or exceeds all university core curriculum requirements.

Students enrolled in mechanical engineering cooperative programs may take a one-credit course (ME 198, 298, 398, 498) at the appropriate level each academic period in which they are enrolled in the program. These credits are in addition to the total required for other mechanical engineering students.

NOTE: Students are required to consult with their faculty advisor prior to registration.

Bachelor of Science in Mechanical Engineering

Credits

I. UNIVERSITY CORE CURRICULUM REQUIREMENTS 30-35

NOTE: Refer to the Core Curriculum chapter of this catalog for information regarding the "Core English and Math Completion Policy".

A. English—3-8 credits

Refer to the "English" section of the Core Curriculum chapter in this catalog 3-8

NOTE: Students who place in ENG 102 are not required to complete ENG 101.

B. Mathematics—4 credits

MATH 181—Calculus I* 4

C. Natural Sciences—8 credits

CHEM 201—General Chemistry for Scientists and Engineers I **OR**
CHEM 121—General Chemistry I* 4
PHYS 180—Physics for Scientists & Engineers I* 3
PHYS 180L—Physics for Scientists & Engineers Laboratory I* 1

D. Social Sciences—3 credits

ECON 102—Principles of Microeconomics 3

E. Fine Arts/Diversity—3 credits

Refer to the "Fine Arts" section of the Core Curriculum chapter in this catalog 3

NOTE: Must not be a skills course. Choose an appropriate course that simultaneously fulfills both the Fine Arts and Diversity core requirements.

F. Core Humanities—9 credits

CH 201—Ancient and Medieval Cultures 3
CH 202—The Modern World 3
CH 203—American Experiences and Constitutional Change 3

G. Capstone Courses

Included in major requirements.

H. Diversity

Recommended that students take an appropriate course that simultaneously fulfills both the Fine Arts and Diversity course requirement.

II. ADDITIONAL COLLEGE REQUIREMENTS 0

III. MAJOR REQUIREMENTS 96

A. Communications—3 credits

ENGR 301—Engineering Communication 3

B. Additional Mathematics and Sciences—21 credits

MATH 182—Calculus II* 4
MATH 283 R—Calculus III* 4
MATH 285—Differential Equations* 3
Mathematics/Science elective (calculus-based upper-division math or science or Physics 182) 3
ME 303—Applied Numerical Methods 3
PHYS 181—Physics for Scientists & Engineers II* 3
PHYS 181L—Physics for Scientists & Engineers II Laboratory* 1

C. Engineering Courses—72 credits

CEE/ME 241—Statics* 3
CEE 372—Strength of Materials* 3
CS 241—Intro to Computer Methods for Engineers 3
EE 220—Circuits I 3
EE 220L—Circuits I Laboratory 1
ENGR 490—Fundamentals of Engineering Exam 0
ME 150—Introduction to Mechanical Engineering 3
ME 151—Introduction to Mechanical Engineering II 3
ME 242—Dynamics 3
ME 310—System Analysis and Design 4
ME 311—Engineering Thermodynamics I 3
ME 314—Introduction to Heat Transfer 3
ME 322 R—Instrumentation 4
ME 343—Dynamics of Machinery 2
ME 351—Mechanical Design 4
ME 367—Elementary Fluid Mechanics 3
ME 410—Introduction to System Control 3
ME 451—System Design (capstone) 3
ME 452—Design Synthesis (capstone) 4
MSE 250 — Elements of Materials Science 3
Mechanical Engineering Electives 6

Restricted Electives 8

Select any two course/lab combinations from the following:
ME 312/312L

ME 414/414L or ME 417/417L
ME 431/431L
ME 444/444L
ME 453/453L
ME 467/467L
(a total of three lab credits may be applied to fulfill major requirements)

IV. MINOR REQUIREMENTS.....0

V. ELECTIVES.....0-3

VI. TOTAL CREDITS.....129
*Must complete these courses with at least a "C"

VII. RECOMMENDED SCHEDULE

First Year—Fall Semester
CHEM 201—General Chemistry for Scientists and Engineers I **OR**
CHEM 121—General Chemistry I*.....4
ENG 101—Composition I.....3
MATH 181—Calculus I*.....4
ME 150—Introduction to Mechanical Engineering.....3
TOTAL.....14

First Year—Spring Semester
ECON 102—Principles of Microeconomics.....3
ENG 102—Composition II.....3
MATH 182—Calculus II *.....4
ME 151—Introduction to Mechanical Engineering II.....3
PHYS 180—Physics for Scientists and Engineers I* 3
PHYS 180L—Physics for Scientists & Engineers Lab I* 1
TOTAL.....17

Second Year—Fall Semester
CEE/ME 241—Statics*.....3
CS 241—Intro to Computer Methods for Engineers.....3
MATH 283 R—Calculus III *.....4
MSE 250—Elements of Materials Science.....3
PHYS 181—Physics for Scientists and Engineers II*.....3
PHYS 181L—Physics for Scientists and Engineers Laboratory II*.....1
TOTAL.....17

Second Year—Spring Semester
CEE 372—Strength of Materials*.....3
CH 201—Ancient and Medieval Cultures.....3
EE 220—Circuits I.....3
EE 220L—Circuits I Laboratory.....1
MATH 285—Differential Equations*.....3
ME 242—Dynamics.....3
TOTAL.....16

Third Year—Fall Semester
ENGR 301—Engineering Communication.....3
ME 303—Applied Numerical Methods.....3
ME 311—Engineering Thermodynamics I.....3
ME 343—Dynamics of Machinery.....2
ME 367—Elementary Fluid Mechanics.....3
TOTAL.....14

Third Year—Spring Semester
CH 202—The Modern World.....3
ME 310—System Analysis and Design.....4
ME 314—Introduction to Heat Transfer.....3
ME 322 R—Instrumentation.....3
ME 351—Mechanical Designs.....4
TOTAL.....17

Fourth Year—Fall Semester
CH 203—American Experiences and Constitutional Change.....3
ENGR 490—Fundamentals of Engineering Exam.....0
ME 410—Introduction to System Control.....3
ME 451—System Design.....3
Core Curriculum Fine Arts/Diversity course.....3
Mechanical Engineering Restricted Elective.....4
TOTAL.....16

Fourth Year—Spring Semester
ME 452—Design Synthesis.....4
Mathematics/Science Elective.....3
Mechanical Engineering Electives.....6
Mechanical Engineering Restricted Electives.....4
TOTAL.....17

* In addition to the general university requirements of at least a "C" (2.0) average for graduation, engineering students must earn at least a "C" in those courses designated with an asterisk (*) and must also maintain at least a "C" average in the core mathematics and science courses and the major requirements courses.

Minor in Mechanical Engineering

The following requirements apply to the minor program in mechanical engineering.

1. At least 18 credits of formal courses must be completed in the minor department, 12 credits of which are upper-division courses approved by the chairman of both the minor and major departments.
2. The 12 credits of upper-division courses in the minor department must be in addition to the credits completed in upper-division required courses in the major department. Course requirements are specified by the curriculum of the major department.
3. In addition to the general university requirements of at least a "C" (2.0) GPA for graduation, all Mechanical Engineering minors must earn at least a "C" in those minor courses designated with an asterisk (*) and a "C" average for all courses used to satisfy the minor requirements.

Graduate Programs

The department currently offers the master of science and doctor of philosophy degrees in mechanical engineering. The department does not have a language requirement for the Ph.D. degree.

The program of courses and research for both the master's and doctoral degrees is tailored to the background, needs and interests of the individual student.

Both Plan A (requiring the completion of a thesis) and Plan B (nonthesis) master's degree programs are available. All master's degree candidates are initially accepted into Plan B, but may be invited to complete Plan A in cooperation with a faculty research advisor.

Graduate students in Plan A are eligible to apply for teaching assistantships.

Current areas of research include:

- Nuclear Waste Transportation Safety
- Heat Transfer Augmentation
- Fluid-Solid Interaction
- Viscoelasticity
- Biofluid/Solid Mechanics
- Fluid Mechanics
- Temperature Control of Electronic Devices
- Thermodynamics
- Solar Energy Collection and Systems
- Mechanics of Fiber-reinforced Composites
- Manufacturing Processes
- Gas Turbine Engine Heat Transfer
- Sports Biomechanics
- Dynamics of Ground Vehicles
- Computer Aided Design
- Intelligent Materials and Systems
- Active Structural Control

- Geothermal Heating and Power Production

For more information, refer to the Graduate School section of this catalog or contact the department chair.